









# Safety MANUAL

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Welcome to the our growing family of Vactor customers. The current series of units reflect the latest developments from the continuous research program of our engineering staff. Our research brings you the latest and most efficient pneumatic cleaning and jet-rodding equipment available in the world today.

Forward

This Safety Manual contains information on all aspects of the safe operation of a Vactor unit. We describe uses of the product to assist with the many unique jobs you will encounter. We also include representative samples of typically used safety and instruction decals. Because all Vactor units are custom, decals may vary. A guide listing decals is available for each specific model. We encourage you to replace decals when they become worn or illegible. Proper operation and maintenance of your unit is critical to protect the safety of operators and others, and to maximize performance and product life. Each person should familiarize himself with this manual as well as proper operating procedures before operating unit or maintaining the unit.

The information, specifications, illustrations and parts numbers in these publications are based on the information in effect at the time of approval for publication. We are constantly improving our products and, therefore, reserve the right to make changes at any time without notice.

If a question arises concerning your Vactor product or this publication, please contact your Vactor® Manufacturing, Inc. distributor.

This manual is for use only with units meeting Vactor Mfg., standards. If your unit does not meet these standards, contact your Vactor representative to have your unit retrofit to meet these standards.



for the latest FSESG product and application safety information.



Manufacturing, Inc.

1621 S. Illinois St. Streator, IL 61364 Ph: 815-672-3171 Fax: 815-672-2779 Subsidiary of Federal Signal Corporation

#### Please keep Vactor Mfg. Informed of any change of vehicle ownership or address.

This operator's manual should be considered a permanent part of the your unit and should be with the vehicle at all times for ready reference.

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HIGH PRESSURE WATER

SAFETY

## 

### **IMPORTANT MEDICAL INFORMATION**

#### An injury caused by high pressure waterjets can be serious. In the event of any waterjet injury:

- Seek medical attention immediately. Do not delay!
- Inform the doctor of the cause of the injury.
- Tell the physician what type of waterjet project was being performed at the time of the accident and the source of the water.

### Medical Alert Note to Physician

This patient may be suffering from a waterjet injury. Evaluation and management should parallel that of a gunshot injury. The external manifestations of the injury cannot be used to predict the extent of internal damage. Initial management should include stabilization and a thorough neurovascular examination. X-rays can be used to assess subcutaneous air and foreign bodies distant from the site of injury. Injuries to the extremities can involve extensive nerve, muscle, vessel damage, as well as cause a distal compartment syndrome. Injuries to the torso can involve internal organ damage. Surgical consultation should be obtained. Aggressive irrigation and debridement is recommended. Surgical decompression and exploration may also be necessary. Angiographic studies are recommended pre-operatively if arterial injury is suspected. Bandages with a hygroscopic solution (MgSO4) and hyperbaric oxygen treatment have been used as adjunctive therapy to decrease pain, edema and subcutaneous emphysema. Unusual infections with uncommon organisms in immunocompetent patients have been seen; the source of the water is important in deciding on initial, empiric antibiotic treatment, and broad-spectrum intravenous antibiotics should be administered. Cultures should be obtained.

Operators using or working around high pressure water systems need to take additional precautions including specialized personal protection equipment. Additional information on high pressure water safety and this information is provided by and available as a wallet card from:

#### Also available from the WJTA:

Industry Best Practices for the Use of High Pressure Waterjetting Equipment

Recommended Practices for the Use of Industrial Vacuum Equipment



WJTA 906 Olive Street, Suite 1200 Saint Louis, MO 63101

(314) 241-1445 fax (314) 241-1449 e-mail: wjta@wjta.org website: www.wjta.org

VACUUM

SAFETY

## **WARNING**

### **IMPORTANT MEDICAL INFORMATION**

#### An injury caused by pressure vacuums can be serious. In the event of a vacuum injury:

- Seek medical attention immediately. Do not delay!
- Inform the doctor of the cause of the injury.
- Show the doctor this card.
- Tell the physician what type of vacuum project was being performed at the time of the accident and the source of the material being vacuumed.

### Medical Alert Note to Physician

This patient may be suffering from a high pressure suction injury. An extreme pressure to a body part may lead to severe underlying internal body damage that cannot be seen from the outer skin. While bruising may vary, it can also be delayed and should not be the primary basis for predicting internal damage. Case studies have shown a severe suction to a major body part (an entire arm for example) can lead to massive pooling of blood in that area, thereby causing circulatory collapse. Close monitoring of vital signs with ability for quick fluid replacement and resuscitation should be of high importance. Additional concerns would be a compartment syndrome to the affected muscular area, large hematomas that may need to be drained, and varying sizes of skin disruption/lacerations. Consider surgical consultation. Imaging should be considered to assess internal soft tissue damage. These injuries usually occur in non-sterile environments, lending themselves to the potential for contaminated wounds. Tetanus status may need to be updated.

Operators using or working around vacuum systems need to take additional precautions including specialized personal protection equipment. Additional information on vacuum safety and this information is provided by and available as a wallet card from:



Also available from the WJTA:

Industry Best Practices for the Use of High Pressure Waterjetting Equipment

Recommended Practices for the Use of Industrial Vacuum Equipment

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(314) 241-1445 *fax (314) 241-1449* e-mail: wjta@wjta.org website: www.wjta.org

SERVICE HOTLINE

SAFETY

The Vactor Service Team provides assistance to all Vactor/Guzzler/TRUVAC dealers and customers via remote (telephone, e-mail, fax, etc.) and on-site (dealer/customer visits, field training, etc.) support operations.

### **Toll-Free Telephone**

### 1-877-DIAL ESG (877) 342-5374

### Fax (815) 673-1621 • Website www.vactor.com

Outside the USA or Canada call 01-847-741-4330

### Technical Support • 24 hours/Day, 7 Days/Week!

You will be asked for specific information pertaining to the type of unit you are calling about, Vactor, Elgin, Guzzler, TRUVAC, etc. You will be asked for the zip code you are calling from. Your call will then automatically be transferred to the Vactor dealer closest to you. If it is after normal business hours and the closest dealer to you does not have a 24-hour line, your call will be transferred to a factory service technician.

When the dealer or the technician answers, you will be asked for the model and serial number of the Vactor unit you are working on. Please have that number available. It will definitely help to expedite our being able to help you with any questions or problems you have. Our plan is to service our customers to the best of our ability 24 hours a day, seven days a week, no matter where you are in the world!

#### General Warning

SAFETY

## 

Vactor cannot possibly, know, evaluate, and advise the service trade of all conceivable ways in which operation or service might be done or the possible hazardous consequences of each way. Anyone who uses operational procedures, service procedures, or tools, whether recommended by Vactor or not, must first satisfy himself thoroughly that neither his safety nor the product safety will be jeopardized by the methods he shall select.

Vactor vacuum systems are designed to user specifications. The owner/operator/user is responsible for the safe use and application of this equipment and proper waste disposal. Transportation and disposal of waste may be subject to local, state or federal laws.

Read and follow the safety practices described in this manual and in the common industry references that are also provided to help in the decision making process.

#### **General Safety Procedures**

- 1. Perform all operations with at least two operators.
- 2. Only trained personnel should operate, perform maintenance, or repair the unit.
- 3. Work area must be clear and clean for good visibility and footing.
- All operators must wear safety apparel: hard hat, visor and / or goggles, ear protection, rain suit, safety-toe shoes or boots with non skid soles and water proof gloves are recommended.
- 5. Never alter system components or reprogram. System components must be used only as intended.
- 6. If a malfunction occurs, immediately stop and follow repair instructions.
- 7. In case of freezing conditions, drain water from all components.
- 8. The unit must be thoroughly cleaned between jobs to prevent cross contamination or chemical reactions.
- 9. Never use this unit in any type of rescue operation where the vacuum is used for the rescue.

- 10. Operating the unit inside a building or confined areas can create additional risks to the unit, operators and building occupants. Engine exhaust gas can reach deadly levels. Heat build up from the engine and blower discharge can overheat people and equipment.
- Never use an air mover machine for vacuuming hydrocarbon or flammable materials unless the flash point of the material is 140° (F) or higher. Pressurized or pump off loading is not permitted unless the flash point of the material is 140° (F) or higher unless nitrogen is present.
- 12. Never operate engines where there are or can be combustible vapors. Vapors pulled in to an engine air intake can cause engine acceleration and over-speeding. This can result in death, injury and property damage.
- 13. Reference to OSHA regulations are for informational purposes only and not intended as legal advice.
- 14. The use of this equipment in the removal or handling of any regulated substance or material must be performed in strict accordance with all applicable federal, state and local laws and regulations, and approved safety and personal protection equipment and clothing must be used and worn at all times.
- 15. Never use an air mover machine to vacuum dusty materials until the Safety Data Sheet(s) (SDS) have been consulted to determine if the dust(s) haves an explosive potential (Combustible Dusts). Only air mover units that are part of a verified assured grounding system that have bags, doors and any other non-welded debris body components grounded to the debris body can be used if the materials contain combustible dusts.
- 16. Consult any applicable SDS as well as OSHA regulations, guidelines, and information to ensure safety of operators for exposure to potentially hazardous dust.
- 17. Distracted or impaired operation and driving - This covers a broad range of issues that includes texting, cell phone use, under the influence of drugs or alcohol, fatigue, etc. All put operators and bystanders at risk of an accident. All operators must be alert and attentive to the work at hand.

**GENERAL WARNING** 

### SAFETY

### NOTICE

Everyone associated in any way with a Vactor® Mfg. product must thoroughly understand and apply the contents of this manual. It is the responsibility of the owner to train his employees in the operation and safety procedures while operating or repairing this equipment.

No one shall operate or service this Vactor Equipment until they have read and understand the operating manual. Additional copies of the manuals may be obtained from your Vactor distributor or by contacting the factory.

Please specify model and serial no(s).



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Jump Starting Or Welding Can Damage Electrical System

To avoid damage:

- Disconnect ECU, control modules and batteries before welding on unit.
- Disconnect control modules before jump starting. Consult chassis service manual for details on jump starting.
- Never use a test light when troubleshooting. Only use digital multimeter on all circuits. Test lights and older analog meters can damage the electronic systems.
- Set all ignition switches to OFF before testing CANbus system.

### NOTICE



Consult OEM chassis and engine operation and maintenance manuals for complete details on operation.

### NOTICE



**Custom Machine Parameters** 

Reprogramming the chassis or engine controls will result in problems ranging from improper operation to complete loss of service. Follow chassis manufacturer's procedures when reprogramming to avoid the loss of the custom machine parameters.

### NOTICE

#### Safe Work Zone

Bystanders must be kept a minimum of 15 feet from the work area. NEVER stand directly behind the truck when raising or lowering the body.



#### Know Your Units' Capacity and Rules of Operation

NEVER exceed your Gross Vehicle Weight (G.V.W.). It is possible to overload the unit capacity just as well as the family car or pick-up truck.

Know your Gross Vehicle Weight Rating (G.V.W.R.). Know your axle capacities. The following procedures should be adhered to.

- 1. Load your vehicle to stay within the G.V.W.R. while traveling on the highway.
- 2. Load your water supply at or near the job site.
- 3. Regulate your work to maintain minimum water storage when leaving the work location.
- 4. If in off-road applications and industrial usage the G.V.W. is exceeded, operate the unit at 15mph or less. Speed limits are estimates and conditions such as rough terrain may require much lower speeds.
- 5. Maintain proper brake adjustment at all times. Check brakes daily.
- **Note**: In operation on public highways, the combined weight of the chassis, body, and payload must not exceed the Gross Vehicle Weight Rating of the chassis as rated by the Chassis Manufacturer.

#### SAFETY STANDARDS

SAFETY

These standards apply to the operation and maintenance of Vactor® Mfg. equipment, both old and new units.

The following definitions apply to all terms used throughout this manual unless otherwise stated.

**DISTRIBUTOR:** A person that distributes Vactor® equipment to a person or employer.

**EMPLOYER:** A person that hires one or more persons to work in the business of maintaining or operating equipment.

**HAZARD:** Description of a physical or environmental condition that creates the potential for injury.

**MAINTENANCE PERSON:** A person who cares for, inspects, cleans, maintains and repairs Vactor® Mfg. equipment.

**OPERATOR:** A person who controls the use and operation of Vactor® Mfg. equipment other than in the course of servicing or repair.

**PERSON:** An individual, corporation, partnership, legal entity or business.

### **A** WARNING



Crushing Hazard

NEVER leave body raised or partly raised while vehicle is unattended

or while performing maintenance or service under body unless body is propped to prevent accidental lowering. [Always disengage PTO when hoist is not in use or when moving vehicle.] The debris body MUST BE empty for service work.

NEVER attempt to raise body when vehicle is on unlevel ground.

Rear door MUST BE opened before the front of the body is 3 feet above the chassis frame. Operator must remain at controls during all operations.

#### OPERATION

It shall be the responsibility of the Employer to:

- INSTRUCT EMPLOYEES NEVER TO GO UNDER A RAISED LOADED BODY.
- INSTRUCT EMPLOYEES NEVER TO GO UNDER A RAISED BODY WITHOUT SECURELY PROPPING IT. BODY MUST BE EMPTY.

- INSTRUCT EMPLOYEES NEVER TO USE ACCESS LADDERS OR GO ON THE UNIT WHILE THE UNIT IS RUNNING. THE UNIT MUST BE SHUT DOWN.
- Provide properly maintained equipment that meets all applicable codes, local, state and federal ordinances and safety standards
- Instruct and train operator in safe and correct methods of operation before assigning any person to operate unit. Such instructions and training shall include all operational and safety data furnished by the manufacturer.
- Prohibit operator from operating unit unless trained and qualified. All employees should be properly trained.
- All personnel operating or in the vicinity of the equipment need to be trained on the hazards and precautions of vacuum, high pressure water and compressed air.
- All decals are in place and legible.
- Be sure the in-line vacuum relief safety is properly installed.

#### It shall be the responsibility of the Employee to:

- NEVER GO UNDER A RAISED LOADED BODY.
- NEVER GO UNDER A RAISED BODY WITHOUT SECURELY PROPPING IT. BODY MUST BE EMPTY.
- Use all safety features provided on the unit and abide by all safety instructions.
- Operate unit only after being instructed and trained in accordance with instructions given in (Employer Responsibility).
- Report any damage or malfunction of the unit or components to your employer, either at occurrence or at end of working day, depending on the extent of damage or malfunction.
- NEVER ride, or let any other person ride on ANY part of the vehicle other than in the cab when the vehicle or hoist is in motion.
- Be certain that all individuals and obstructions are clear to the hoist and body before operating the controls and be ready to stop operation at any time that a hazardous condition might occur.
- NEVER leave raised or partly raised body while vehicle is unattended or while performing maintenance or service under the body unless body is propped to prevent accidental lowering.

#### SAFETY STANDARDS

Shut off chassis engine and remove ignition keys under the above conditions.

- Jewelry should not be worn during operation and maintenance of the vehicle. This includes, but is not limited to, watches, rings, ear rings and necklaces.
- Be sure the in-line vacuum relief safety is properly installed.
- All personnel operating or in the vicinity of the equipment need to be trained on the hazards and precautions of vacuum, high pressure water and compressed air.

#### MAINTENANCE

### It shall be the responsibility of the Employer to instruct maintenance personnel:

- NEVER GO UNDER A RAISED LOADED BODY.
- NEVER GO UNDER A RAISED BODY WITHOUT SECURELY PROPPING IT. BODY MUST BE EMPTY.
- Ensure adequate care for, cleaning, inspecting and maintaining the entire unit.
- Establish and follow a program of regular maintenance to ensure that the complete unit is in a safe operating condition and in accordance with the manufacturer's recommended specifications. A record of these inspections and of any maintenance work shall be kept.
- See that all maintenance personnel are competent personnel, trained for this purpose.
- Provide an adequate and safe work area for the maintenance personnel to maintain the unit. Complete area to be free from all hazards.
- Establish procedures for mandatory use of safety equipment when working.
- Establish a procedure wherein the engine will be shut off, the ignition key removed, and a sign stating "UNIT UNDER REPAIR - DO NOT OPERATE" be displayed on the steering wheel, during repairs to unit, except during maintenance testing.

### It shall be the responsibility of the Maintenance Personnel to:

- NEVER GO UNDER A RAISED LOADED BODY.
- NEVER GO UNDER A RAISED BODY WITHOUT SECURELY PROPPING IT. BODY MUST BE EMPTY.
- Follow all of the employer's programs and use all the safety procedures established by the employer and manufacturer.
- Make all repairs in accordance with all applicable codes, local state and federal ordinances and according to the design specifications as recommended by the manufacturer.

### **A**WARNING

#### Part Failure Hazard

To avoid serious injury or death use only Vactor® Manufacturing supplied replacement parts. Use only Vactor® Mfg. supplied hose, fittings, and tools to repair or replace high pressure hose.

#### **RECONSTRUCTIONS OR MODIFICATIONS**

- Any reconstruction or modification to this Vactor® equipment shall be the responsibility of the person making these reconstructions or modifications.
- Any person reconstructing or modifying this Vactor® equipment must furnish instructions with the reconstruction or modification. These instructions shall include operating, maintenance and safety precautions associated with the reconstruction or modification.

### 

#### **Cancer and Reproductive Harm**

Required for compliance with California Prop 65. Refer to: <u>www.P65Warnings.ca.gov</u>

#### WARNING DECALS

SAFETY

**CAUTION Decal** 

- These indicate

not avoided, may

result in minor or

moderate injury. It

may also be used

unsafe practices,

to alert against

a potentially hazardous situation which, if

Vactor uses several different types of warning decals on their units. These decals come in a variety of colors, shapes and sizes. Not all decals are used different Vactor models. Each unit will have it's own set of warning decals. Each warning decal has a number located in the lower right corner. Contact the factory with that particular number for replacement decals. Even though Vactor uses many different decals on their units, the decals fall into five (5) different categories, danger, warning, caution, machine caution, and notice.

Machine caution is being phased out and replaced with notice due to updates to industry decal standards.

#### DANGER Decal - These warn the operator of an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING Decal - These warn the operator of a potentially hazardous situation which, if not avoided, could result in death or serious injury.

NOTICE

Check unit daily making certain all decals are in

place and readable. Replace as needed.

for details

NOTICE Decal - These indicate information considered important, but not hazard-related (e.g. messages relating to property

#### SAFETY INSTRUCTIONS Decal

- These indicate specific safetyrelated instructions or procedures

#### SAFET\ INSTRUCTIONS

If fans cause excess vibrations, shut engine off and follow procedure as described in the maintenance section of the operator's guide. F

which could cause damage to **WARNING** CAUTION the equipment. Crushing Hazard Cancer and Can cause severe injury or Reproductive Harm death. Required for compliance with Before servicing, lock out California Prop 65. Refer to: electrical switches and www.P65Warnings.ca.gov hydraulic valves before Wear protective equipment including footwear and working on unit. gloves when using or servicing this machine. Read SAFETY section NOTICE NOTICE or details MACHINE **CAUTION Decal -**Driveline can be Electrical system NOTICE CAUTION without damaged. can be damaged. Open vacuum relief valve. the safety alert Do not weld on unit. No one shall operate or service Lower engine RPM to idle Disconnect all chassis and this equipment until they read symbol indicates before engaging or unit ECU's and batteries and understand the operation a POTENTIALLY disengaging blower. and maintenance manuals. before welding on unit. and maintenance management Additional copies can be Failure to open vacuum hazardous Electrical systems may be obtained by calling the relief valve and lower engine damaged by welding. 24 hour a day service hotline. In the USA or Canada Call: situation which, if RPM to idle before engaging or disengaging blower may not avoided, may 877-DIAL ESG or 877-342-5374. Outside the USA or Canada call result in serious engine, result in equipment 847-741-4330 transmission or blower Read Service manuals and a start damage). or property damage.

damage.

Note: MACHINE CAUTION is

out and replaced

being phased

with NOTICE

per changes in

the ANSI Z535

industry standard.

В

#### GENERAL

Safety is the primary concern in all operations and is everybody's responsibility. All vacuum truck operations must be performed with at least two operators. The operators of any equipment must always be aware and alert to any potentially unsafe condition due to its size, weight, operating capabilities or maneuverability. If a question or concern in this regard exists, the matter should be discussed with the supervisor before operating the machine.

Remember safety first and always, is a good motto. Constantly evaluate the safety concerns as you go. Short cuts, bypassing safety devices for the sake of production, jeopardize everyone's safety and should not be done. Doing a job well is doing it in a safe, efficient, timely and economical manner. Safety of the operator and other personnel involved is of the primary concern and overrides everything else.

Safe operation requires well maintained equipment. Constantly monitor the condition of your equipment, not only before operating it but also during and after the end of operations.

Before Operation - inspect the equipment prior to using it. Check the operating locale for overhead or surrounding obstructions. Is there any other equipment or personnel working in the vicinity of your loader which might interfere in your safe operation or theirs?

During Operations - constantly look out for any situation that may develop during operations which might compromise the safety of men and machine. Train your eyes and ears to the sights and sounds of the equipment - learn to distinguish between the normal and abnormal sounds of the unit in operation. Look for any movement in an area where none is expected.

After Operation - Make sure that the equipment is properly shut down and everything is properly stowed and secured. Any unintended movement of the machine should be blocked and all switches turned off.

#### **General Safety Procedures**

Inspect the cab for warning tags indicating a possible problem with the equipment. If warning tags are present, equipment must not be operated under any circumstances.

Always operate equipment with lights on.



Never wear loose clothing or jewelry that

can catch on controls or other parts of the

machine. The wearing of finger rings is prohibited.

Ensure that all protective guards and covers are in place.

Keep the machine, especially the walkways and steps, free of foreign materials. Loose items such as lunch boxes and tools must be secured. The operator compartment must be kept clean.

Keep windows clean for good visibility.

Know hand signals and who is to give them. Accept signals from only one person with the exception of the STOP signal, which must be accepted from anyone.

Never put maintenance fluids in glass containers. Only properly labelled and approved containers should be used.

Pressurized air can cause personal injury. When using pressurized air for cleaning, wear a protective face shield and protective clothing.

Approved ANSI Z89 standard hard hats, ANSI Z87 standard safety glasses with permanent side shields and approved hearing protection.

D

Protective boots or shoes should be worn at all times. OSHA says

protective footwear must comply with the ASTM standards F2412-05 and F2413-05 (*American Society for Testing and Materials*. Formerly was ANSI Z41, *American National Standard Institute* standard for Personal Protection - Protective Footwear). A hazard assessment should be made to determine the correct level of footwear safety protection.

Refer to the PPE section for additional information.

	<b>U</b>		
Recommended Safety Apparel			
Α	ANSI Z89 Hard Hat		
В	Hearing protection		
С	ANSI Z87 Safety Glasses w/ Side Shields		
D	One-piece Protective Suit		
E	Protective Handwear		
F	Protective Footwear		

GENERAL DRIVING AND OPERATION

#### Distracted or impaired operation and driving

This covers a broad range of issues that includes texting, cell phone use, under the influence of drugs or alcohol, fatigue, etc. All put operators and bystanders at risk of an accident. All operators must be alert and attentive to the work at hand.



#### SAFETY INSTRUCTIONS

**Best Practices for Dumping** 

- Position unit on level, stable ground.
- Check for overhead wires and obstructions
- Operator must remain at controls during all operations.
- During decanting or offloading liquids, only raise the body no more than three feet, enough to allow the liquid out and not plug the ports.
- Open rear door before dumping.
- Observe the material as the debris raises to make sure it is coming out. If equipped use the vibrator. Do not continue raising if the material is not moving. High pressure water or mechanical removal may be necessary.
- NEVER move the unit with the debris body in the up or raised position.

#### Vibrator (if equipped)

 The vibrator can be used to dislodge any material that is attached to the sides of the debris body while raising. Only use short vibrating blasts.



#### **Preparing for Transport**

Prior to transport secure all tools, hoses and all miscellaneous items in their storage locations.

- All items in tool trays and racks need to be secured or tied down.
- If equipped, secure boom in transport mode.
- If equipped, lower debris body, close rear door.
- If equipped, secure all hose ends on hose reels.
- Close and secure all cabinet, tool box and control panel doors and covers.
- Remove and stow all hoses, suction tube, extension pipes and accessories.
- Disengage the hydraulic, vacuum and water systems.
- Check and clear the area around the unit before moving.

**CRUSHING AND CUTTING PREVENTION** 

#### **Crushing and Cutting Prevention**

Unless otherwise specified, never make adjustments while the machine is moving, the blower is engaged or the engine is running.



Equipment and components and attachments should be properly supported when working beneath

them. Any attachment can fall if a control is moved, or if a hydraulic line fails.

Everyone must be clear of the unit before any engine is started.

Stay clear of all rotating and moving parts.

Be aware of pinch points. Where there are attachment linkages or articulating equipment, the clearance in the linkage area will increase or decrease with movement of the attachment or articulation. Never be on the rear door platform while the rear door is being operated.

Keep objects away from moving fan blades. Tools or other objects which fall into moving blades might be thrown out, possibly causing injury to you or anyone nearby. All fans should be properly guarded.

Never use kinked or broken wire rope cable. Always wear gloves when handling any wire rope cable.

Striking retaining pins with force can cause them to fly out and injure you or persons nearby. Always wear protective glasses when striking a retainer pin, chisel or drift pin. Pieces of metal could fly off possibly causing an eye injury or enter your body causing internal injury.

Stay clear of turning drive-lines, belts or chains. All such components are clearly marked with decals on your units. If the decals are damaged, peeling or missing, replace them.

No modifications should be made without contacting the manufacturer. Contact factory service before making any modifications to ensure that such changes do not compromise the safety or void the warranty of the equipment.

#### **Burn Prevention**

Engine coolant is hot and under pressure at operating temperature. The radiator and all lines to heaters or the engine contain hot water or steam and any contact could cause severe burns.

Check coolant level before heating occurs, and if necessary, only after the engine has been stopped and the filler cap is cool enough to remove with your bare hand. Remove filler cap slowly to relieve pressure. Cooling system conditioner contains alkali that can cause personal injury. Avoid contact with the skin and eyes.

Allow cooling system components to cool before draining. Do not allow hot oil or components to contact skin as they can cause personal injury.

At operating temperature the oil in the hydraulic tank is hot and can be under pressure. Remove the filler cap only after the engine has been stopped and the filler cap is cool enough to remove with your bare hand. Remove slowly to relieve pressure.

Relieve all pressure in air, oil, fuel or cooling systems before any lines, fittings or related items are disconnected or removed.

Battery electrolyte contains acid that can cause injury. Avoid contact with skin and eyes.

#### **Fire and Explosion Prevention**

All fuels, most lubricants and some coolant mixtures are flammable. Never smoke in fueling and lubricating areas or where batteries are charged, or where other flammable materials are stored.



SAFETY

Batteries in series may be located in separate compartments.

When using jumper cables, always connect positive (+) cable to positive terminal of battery connected to starter solenoid and negative (-) cable from external source to starter negative terminal. (Connect to the block if there is no starter negative terminal.) Always wear eye protection when working with batteries.

Battery electrolyte contains acid that could produce an explosion and possibly cause injury.

Clean and tighten all electrical connections. Check for frayed or loose electrical wires daily and have them repaired or tightened if needed.

Keep all fuels and lubricants stored in properly marked containers and away from unauthorized personnel. Store oily rags and other flammable material in a protective container. Ether is flammable. Never smoke when using ether and use only in well ventilated areas.

A suitable working fire extinguisher must be with the unit at all times.



**HIGH PRESSURE / ELECTRICAL** 

#### Lines, Tubes And Hoses

Never bend or strike high-pressure lines.



Report loose or damaged fuel or oil lines, tubes or hoses to mechanics so

repairs can be made. Leaks can cause fires.

Replace if any of the following exist:

- 1. Damaged, displaced or leaking end fittings.
- 2. Outer hose covering rubbed through or cut and wire reinforcement exposed.
- 3. Outer hose covering ballooning.
- 4. Flexible part of the hose kinked or crushed.
- 5. Armoring embedded in the outer hose cover.

Make sure that all clamps, guards and heat shields are installed correctly to prevent vibration, rubbing against other parts and excessive heat during operation.

Stay clear of the vacuum hose openings. The suction is high enough to suck in a limb and cause serious bodily injury.

Never use a bare open hose end for vacuuming. A variety of hose end attachments are available to keep the operator clear of the hose opening.

Never try to open any hatches or doors while the unit is still pressurized, doors could fly open and cause injury or death. Release pressure before attempting to open any door or hatch. Merely shutting off the pressurizing pump or the power source, does not relieve the pressure, it has to be released manually.

#### **High Voltage Electrical Hazards**

A potential electrical shock hazard exists with the operation of mobile equipment near high voltage power lines. Follow all OSHA and site rules and regulations.

Equipment includes radio antennas, crane booms and masts, and load heights.



Never dump under power lines. End dumps with raised beds will violate the 10' rule. Dump the load to the side and let a dozer push it into place.

Contact the local electrical utilities for identification of the power rating and proper procedures for working near the lines.







#### High Voltage Power Line

Exceptions are permitted for travel under or work near a power line only if:

- (1) The electrical department is notified for a qualified electrical person to de-energize the power line and implement their Tag-Lock-Try procedures. Or,
- (2) An electrician properly grounds the mobile equipment.

#### **High Voltage Trailing Cables**

Electrical equipment near mining pits is supplied power by trailing cables. In most cases the cables run along the service roads. If a trailing cable blocks your desired route, go back to the main road and find another route to your destination.

#### ELECTRICAL POWER LINES

SAFETY

Follow all requirements for using mobile equipment when working around power lines. The Occupational Safety and Health Administration (OSHA) requirements apply to most workers. The following information is from OSHA. Additional information can be obtained from www.osha.gov.

Maintain distance from overhead power lines in accordance with federal, state, and local regulations.

#### OVERHEAD POWER LINE TIPS FOR CONSTRUCTION WORKERS

**BEFORE YOU BEGIN CONSTRUCTION WORK** 

- Survey the site for overhead power lines. LOOK UP!
- BEST SAFETY PRACTICE: NEVER GET CLOSER THAN 10 FEET TO AN OVERHEAD POWER LINE!
- Consider all overhead lines as energized until the electric utility indicates otherwise, or an electrician verifies that the line is not energized and has been grounded.
- In construction work, an overhead power line safety component should be part of your employer's overall safety and health program and safety training.
- If overhead lines are present, call the utility company and find out what voltage is on the lines. Ask if the utility company can shut off the lines while you are working near them.
- If overhead lines cannot be shut down, ask the utility company if they can install insulation over the lines during the time you will be working near them.

#### WORKING WITH TOOLS & EQUIPMENT

- If the lines cannot be shut down and/or insulation applied, a minimum safe distance of 10 feet must be established. Have a brief job site meeting to discuss the planned work as it relates to the power lines. Discuss topics such as the use of longhandled tools, and equipment (raised dump trucks, back hoes, etc.) that could come in contact with the lines. Consider the need for a designated person to monitor activities around the lines.
- Only use nonconductive ladders when working on or near overhead power lines.
- Employees shall not be permitted to approach or carry any conductive object closer than 10 feet to an energized line. The only exception is for trained and qualified employees using insulated tools designed for high voltage lines.

#### (OVER)

Occupational Safety and Health Administration Region VII (5/99)

### NOTICE

Reference to OSHA regulations are for informational purposes only and not intended as legal advice.

#### OVERHEAD POWER LINE TIPS FOR CONSTRUCTION WORKERS

#### **CRANES/EQUIPMENT**

- If using a crane/equipment near lines rated at 50,000 volts (50 kv) or less, minimum distance between the energized lines and any part of the crane (boom, load line, etc.) shall be at least 10 feet.
- If using a crane/equipment near energized lines rated at 50,000 volts (50 kv) or more, minimum distance between the energized lines and any part of the crane shall be at least 10 feet plus 0.4 inch for each 1,000 volts over 50,000 volts.
- Where it is difficult for the operator to maintain the desired clearance by visible means, an employee shall be designated to observe the distance between the crane/equipment and the line so as to give timely warning to the operator. This should be the ONLY job the monitor is performing when this hazardous condition is present.

#### FOR FURTHER INFORMATION

- The safety tips on this card are not intended to be all-inclusive; they are simply a starting point to help prevent electrocutions from overhead power lines.
- For further information, please refer to the Code of Federal Regulations (CFR), Part 1926. You may also contact your local OSHA Area Office at:

#### Kansas Toll-Free 1-800-362-2896 (KS only)

Nebraska Toll-Free 1-800-642-8963 (NE only)

Western Missouri Toll-Free 1-800-892-2674 (MO only)

Eastern Missouri Toll-Free 1-800-392-7743 (MO only)

Occupational Safety and Health Administration (OSHA) Region VII (5/99)

#### SAFETY SYSTEMS

SAFETY

Several safety systems featured in the units. They are in place for the safety and protection of the operator. These systems are to be used when needed.

#### **Body Support**

When any maintenance is performed that requires working under a raised body (for however short a duration), the raised EMPTY body should be



supported by the safety stand. The safety stand is not a lifting device and must be used in conjunction with the hoist cylinder. Never raise a loaded body unless you intend emptying it. Never support a loaded body with the safety stand. Never remove a hoist cylinder, leaving it supported by the safety stand. To use the safety stand, a) Raise EMPTY body high enough to clear the safety stand in its support position. b) Raise the safety stand. c) Slowly lower the body so that the safety stand rests in the receptacle for it under the body.

#### **Rear Door Support**

Always use the rear door support working inside a body or on or near an open rear door. Your unit has either a safety pin or a safety prop.



Remove and store the safety prop before closing the rear door. Closing the rear door with the prop still in place can cause extensive damage to the rear door.

### 

#### **Overriding Controls**

To avoid injury or death never override any operator controls, fail-safe or deadman features of a control; or hydraulic, mechanical, or electrical safety devices during use.

Follow service instructions for overrides during maintenance.

#### **Drive-line guard**

If a removable drive-line guard is provided to cover the upper drive-line from the transfer case to the blower it is to remain in place unless it is necessary to service the



drive-line. If a latched, hinged door, is provided for easy access to the drive-line for greasing it must be closed and latched when the blower is running.

#### Safety Decals

Safety caution and warning decals are located at various points, which require attention while in the close proximity of the unit. These should be noted and heeded for safety. Never by-pass any safety device.

#### Prevent battery explosions

Batteries can explode. Keep sparks and flames away from batteries. Use a flashlight to check battery electrolyte level



Never check battery charge by

placing a metal object across the posts. Use a voltmeter or hydrometer.

Always remove the grounded (-) battery cable first and replace it last.

Never charge a frozen battery; it may explode. Warm the battery to  $60^{\circ}$  F ( $16^{\circ}$  C).

#### Vacuum and pressure relief valves

All units have safety relief valves, some operate automatically under various conditions and some are operated manually. These are provided for personnel safety and safety of the equipment. Keep all relief valves in good working condition.



Relieve all system pressures before service work.

VALVES

SAFETY

A variety of air and hydraulic actuated butterfly, knife gate and other style valves from a number of different manufacturers are used. A butterfly valve, shown at right, rotates a disc in the material flow to open and closed positions (shown in closed position). A knife gate valve pushes or pulls a sliding gate in the material flow to open and closed positions. When the gate is retracted the valve is open and material can flow.

The valves are normally actuated by switches or automatically by the system controls. During servicing or use an inadvertent actuation could result in an injury from the moving parts. For example the butterfly valve at the cone bottom, shown at right, may automatically actuate while someone is unplugging the cone through the clean out door. The valves can still remain active when not installed unless the air or hydraulic lines are disconnected and all safety precautions followed.



Knife gate valves have external pinch points during operation as the gate is moving. Additionally, inside the material flow path the gate acts as a guillotine when closing.

Never allow tools, arm, hands etc. in the gate or butterfly areas as serious injury may occur. Shut down all systems and de-energize or disconnect the air or hydraulic system to the valve before servicing.

Knife gate valve





**Butterfly Valve** 



**TRUCK OPERATION** 

### 

**Crushing / Tipping Hazard** 

To avoid injury or death:

- Position unit on level stable • around.
- Open rear door before dumping.
- NEVER move the unit with the debris body in the up or raised position.

#### **Starting The Truck Engine**

Never Start the truck engine with the accelerator pedal depressed; always start the engine at low idling speed. These trucks have no oil at the center bearing for a short period of time and starting at high idle could cause bearing failure.

- Be sure that the warning lights for low engine oil pressure and battery charge go off.
- Check to make sure all gauges come up into operating range as truck engine warms up.
- Let the air pressure build up to its maximum, usually 120 psi.

#### Remember

Never crank the engine more than 30 seconds. Allow the starter to cool for 2 minutes between attempts. Excessive starting fluid use will burn pistons and lock up engines. Use only small amounts of starting fluid when absolutely necessary and you are directed to do so by a supervisor.

#### Before moving the truck

- 1. Adjust mirrors
- 2. Clean windows
- 3. Check for low hanging electric or telephone wires and power cables on the ground.
- 4. Recheck gauges and warning lights
- 5. A visual check and warning honk of horn should be performed before moving to ensure safety of people on the ground, and other equipment in use in the area. Operator should have sight of all work area ground personnel before moving. A spotter should be normally used to assist the driver backing up.
- 6. NEVER release the parking brake until the air pressure comes up to operating range on the two brake system gauges and the (Red) warning lights go off.
- 7. Select a gear position
- 8. Operate the truck at low RPM, until proper temperature is reached on the gauges.

#### **Pedestrian Safety**

Conduct a visual check and warning (honk of horn) before moving the truck to ensure the safety of people on the ground, and other equipment in the area.

Be aware of surveyors, supervisors, laborers, etc., who are working on the ground.

To avoid tipping hazards while dumping, park on firm and level ground and open the rear door before raising the body so that the unit does not become top heavy. Clear the area of all pedestrians and equipment before raising the body. Raise the body in steps, allowing material to dump out in a steady flow.





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#### SAFETY

### OPERATIONS

#### **Proper operation**

Besides being knowledgeable of the truck's controls, the operator must always be alert when traveling at high speeds, steering and dumping. Remember this truck is very heavy and will not stop in a short distance. Tipping can occur because of improper steering or dumping.

Below are some important operational techniques.

- Task train all employees before allowing them to operate the equipment.
- Equipment cabs must be kept neat and clean, free of loose objects and trash.
- Equipment operators must obey all traffic safety regulations and operate equipment at a safe speed according to the various road and field conditions.
- Operators must assess the field conditions and recognize the capability of the equipment and determine the safest, most efficient operating manner.
- Apply parking brake before operating unit and use wheel chocks.
- Before starting the operation of equipment, be aware of existing work conditions:
  - 1. Where fellow employees are located.
  - 2. Degree of slopes
  - Field and road conditions (examples: soil stability, slick, muddy, or dusty)
  - 4. Sump holes in work areas
  - 5. Traffic patterns of your equipment as well as other equipment working in the area.
- Always operate the equipment with its lights on.
- Never drive over power trailing cables. Follow the requirements for operating near electrical power lines. (Example: raising dump bed near overhead power cables.)
- Never operate equipment under the influence of alcohol or illegal drugs. If you are taking prescription drugs, know the side effects.
- When stopping, feather the brake pedal to keep from having brakes fade because of heat.
- If a dashboard warning light comes on, stop and determine the cause. Operating a truck with a warning light on can compromise the safe operation of the truck.

- Maintain a safe distance (approximately four truck lengths) between all vehicles and/or equipment to insure a safe stop in the event of an emergency. Distance should be increased when road becomes wet (braking distance lengthens).
- Dusty conditions
  - 1. When following another truck, remain far enough back so you have enough time to react to an adverse condition.
  - In the loading area, when the excavator creates a dusty condition, stay back until it is your turn to get loaded to keep from drawing dust into the engine air system. Be sure you are aware of other operators' locations.
  - 3. Contact your supervisor about dust control.
- Making a sharp turn too fast can result in a tip over. Always use caution when making turns.
- Use an observer for blind spots when maneuvering the unit.





#### **Collision Avoidance**

To avoid serious injury or death wear a safety vest with the appropriate safety symbols when working on job sites in traffic areas. Many accidents occur due to inattentive drivers and collision with cars and trucks.

SAFETY

#### VACUUM

An injury caused by vacuum can be serious. The vacuum action must be stopped as quickly as possible. Seconds matter when the body is subjected to the forces of vacuum. The inline vacuum relief valve must always be used when operating near end of the hose or pipe. In the event of any vacuum injury:

- Seek medical attention immediately. Never delay!
- Tell the physician of the cause of the injury.
- Tell the physician what type of material was being vacuumed at the time of the accident as material may have entered the wound.

Vacuum hazards to avoid when operating include:

- Rupture keep vacuum tools and hoses away from face and body. Concentrated vacuum on the body, such as through a hose end in full contact can result in evisceration of organs or the avulsion of limbs. Serious injury or death will result from vacuum.
- Suffocation keep vacuum tools and hoses away from face and body. Serious injury or death will result from vacuum suffocation.
- Crushing and cutting never attach hose, pipe or accessories with the vacuum on. Forces from the vacuum can trap fingers, hands and feet in the joint with enough force or impact to crush and cut. Material flow in system will increase the severity of the injury by physical damage and contamination of the wound.

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#### Vacuum Hazard

NEVER operate the vacuum system without the Vacuum Relief Valve being installed. Failure to install and operate the Vacuum Relief Valve properly may result in serious injury and / or death.

The INLINE VACUUM RELIEF VALVE must be INLINE within 50 feet from the end of the hose or pipe for proper operation.

#### VACUUM RELIEF VALVE



Place the IN-LINE VACUUM RELIEF VALVE (also referred to as a safety Tee) as close as possible to the working end of the vacuum hose whenever the hose is manipulated by hand. Use the appropriate size Tee for the size hose or pipe being used.

The vacuum relief valve is designed to open the vacuum hose in the case of an emergency. When opened, it creates an immediate vacuum loss at the end of the vacuum hose. It is simple to operate but does require proper installation and testing in order to be effective in the system.



The in-line vacuum relief valve must be tested before each use. Shut down the vacuum system when assembling or moving the piping system.

#### Installation Instructions

- 1. Install the valve on level ground between two sections of hard pipe or vacuum hose close to the vacuum nozzle. Be sure to use the proper size Tee for the hose or have the proper adapters if the pipe being used is different than the Tee size.
- 2. Connect the lanyard to the operator's person. This can be attached to the operator's wrist or to a belt loop. Never place lanyard on the ground or tied to the pipe.
- 3. Adjust the lanyard to a proper length to allow freedom of movement but still allow for easy tripping of the relief valve.



#### **Testing Instructions**

- 1. Install the vacuum relief valve as described above
- 2. Start the vacuum truck and engage the blower. Be sure to follow the proper engagement instructions for the particular unit being used.
- 3. With the vacuum hoses in place, and the vacuum relief valve installed, adjust the engine speed to a mid range RPM.
- 4. Allow the nozzle inlet to become attached to a solid surface such as the ground, asphalt or cement.
- 5. Pull the lanyard to verify that the top plug of the valve will unseat.
- Once you have verified that the valve will unseat properly, shut the vacuum system down and reset the vacuum relief valve. Now you are ready to go to work.

### 

#### Vacuum Hazard

NEVER operate the vacuum system without the Vacuum Relief Valve being installed. Failure to install and operate the Vacuum Relief Valve properly may result in serious injury and / or death.

The INLINE VACUUM RELIEF VALVE must be INLINE within 50 feet from the end of the hose or pipe for proper operation.

VACUUM RELIEF VALVE

SAFETY

#### **Operating Instructions**

Never use a bare open hose end for vacuuming. A variety of hose end attachments are available to keep the operator clear of the hose opening.

- Perform all operations with at least two operators.
- Install and test the inline vacuum relief valve as previously described.
- Should a problem arise with the suction end of the hose, such as a foreign object blocking the end of the hose, give a quick jerk of the lanyard. This will pull the top plug from its seat, which will relieve the vacuum at the end of the hose or nozzle.
- Clear the obstruction from the end of the hose or nozzle.
- Turn off the vacuum system and verify that all objects and personnel are clear before resetting the vacuum relief valve and turning on the vacuum system.
- Once you are certain that the hose or nozzle is clear reset the vacuum relief valve top plug and engage the blower and return to work.

The pendant is a remote control device used for activating the vacuum release valve. It is also used to control booms and other options installed on the unit. Optional wireless pendants are also available.



Pendant (Varies with options)



#### SAFETY INSTRUCTIONS

Unit operator must hold the pendant/remote during vacuum operations and stay within line of sight of the hose end operation. In an emergency, use the E-stop or pendant/remote to disable the vacuum. Maintain clear access to all E-stops and place an operator near one.



#### Vacuum Hazard

NEVER operate the vacuum system without the Vacuum Relief Valve being installed. Failure to install and operate the Vacuum Relief Valve properly may result in serious injury and / or death.

The INLINE VACUUM RELIEF VALVE must be INLINE within 50 feet from the end of the hose or pipe for proper operation.

#### EMERGENCY SHUTDOWN

SAFETY

Refer to the Operations section of the manual for specific details on the unit. This material is intended as an overall guide for Vactor units in general.



#### SAFETY INSTRUCTIONS

### In an EMERGENCY the VACUUM and WATER must be stopped Activate the E-Stop

#### To shut down the system:

- Stop vacuuming.
- Enable vacuum relief valves.
- Reduce engine/blower/fan RPM.
- If required, shut down the engine.

#### Vactor unit emergency stop procedures

Know the procedures for shutting down the various components and options available on the unit. During rodding operations, placing the RODDER PUMP switch in the OFF position can immediately stop propulsion of a nozzle. As a safety feature, the switch must be pulled forward and forced up to engage the rodder pump. This feature prevents accidental engagement of the pump. However, the switch can be placed in the OFF position by simply pushing down on the toggle lever. In an emergency, slap or place the switch in the OFF position, the rodder pump will stop immediately.

The VACUUM RELIEF switch can be used to vent the vacuum system and immediately stop airflow at the end of the vacuum tube. Place the switch in the



ON position to stop airflow and in the OFF position to resume air flow. Some units are equipped with an emergency stop switch that will open the vacuum relief and lower the engine to idle. Actual functions will vary with the model.

Get to know the throttle controls associated with the vehicle! In many situations, disengaging the throttle may prevent an accident or damage to the vehicle. Study this manual for information related to equipment operation and safety procedures.

#### Guzzler unit emergency stop procedures

Know the procedures for shutting down the various components and options available on the unit.

The VACUUM RELIEF switch can be used to vent the vacuum system and immediately stop airflow at the end of the vacuum hose. Some units are equipped with an emergency stop switch that will open the vacuum relief and lower the engine to idle. Actual functions will vary with the model.

Get to know the throttle controls associated with the vehicle! In many situations, disengaging the throttle may prevent an accident or damage to the vehicle. Study this manual for information related to equipment operation and safety procedures.

The in-line vacuum relief valve is the primary safety to relieve vacuum at the hose end and must be used in all operations (see Vacuum Relief Valve in this section).

#### HIGH PRESSURE WATER

When setting up for rodding operations use the appropriate guide fin and hose guard (tiger tail) to prevent the nozzle from turning in the pipe and returning toward the operator. The length of the assembled nozzle and

guide fin must be greater than the diameter of the pipe to be cleaned.



Inspection be clouned.

Inspect the minimum rodder hose length often for indications of damage or wear. Check the hose before each

use for movement in hose fittings, exposed hose reinforcement, kinking or collapsing, blisters or bubbles and fittings that are improperly installed or cutting into the hose.



When splicing hoses read the maintenance section of the manual for instructions on hose repair. All hose manufacturers have instituted a color code system for identification of the hose, fittings and tools. When repairing a rodder hose the inside

color of the hose, the color of the fitting and the die colors must match. Fittings from one manufacturer will not properly crimp onto hose from

another manufacturer. The outside color of rodder hose indicates the pressure rating of the hose and



must match during splicing operations. Be aware of the operating pressures associated with the vehicle and the proper hose specifications for safe operation. National Association of Sewer Service Companies publishes a variety of industry related recommended practice guides.

#### NASSCO, Inc.

2470 Longstone Lane, Suite M Marriottsville, MD 21104 (410) 442-7473 • Fax (410) 442-7788

http://nassco.org/

### **WARNING**

Out of control hose can cause severe injury or death.



The rodder hose creates

tremendous pressure and must not be fitted with a reducer or hand held nozzle, or operated outside of the sewer pipe. The back pressure created by such action will cause loss of control and violent movement of the hose and fittings, and the release of high pressure water.

Never use improper fittings or use out of sewer pipe. Refer to manual for details.

### 

High pressure water

High pressure water can cause serious injury or death.



Special safety equipment is required when operating the high-pressure handgun. Always wear safety toe shoes or boots (waterproof shoes or boots preferred), coveralls, face shield and safety goggles and gloves (waterproof gloves preferred).



#### SEWER CLEANING

Safety

The following pages cover basic cleaning of catch basins, jet rodding operations and simultaneous vacuum and jet rodding operation.

Be aware of traffic and pedestrians on the job site. Use extreme caution while moving around the vehicle to avoid contact with moving vehicles. When moving the boom or vehicle make sure pedestrians are clear of the area. Use orange safety cones to mark the work area.

Germs and other biological hazards are common in sewers. All operators must wear safety apparel: hard hat, visor and / or goggles, ear protection, rain suit, safetytoe shoes or boots with non skid soles and water proof gloves are recommended to avoid injury and contamination. Additional equipment may be required as determined by an on site safety assessment.

#### Before Jetting A Line, The Operator Should Consider The Following Points

- If the manhole is surcharged, relocate to a manhole downstream. A surcharged manhole is one that water has risen above the top of the outlet pipe. This makes it impossible to see the line you are trying to clean.
- The size of pipe should be determined in order to use the proper size nozzle and nozzle support guide.



Determine the direction
 the line is supposed to
 flow. Always jet against the flow or upstream!

#### When Jetting a line

 When starting to jet a line or anytime the rodder nozzle cleaning the line is near the manhole, spray or mist can be forced out. If equipped, use the unit's vacuum system to reduce the spray or mist by lowering the vacuum tube into the manhole about one foot or more and allowing the vacuum airflow to capture it.

#### Starting nozzle in line

- Place nozzle in the line before turning water pump on.
- Use low water flow to minimize water jetting out of the line.
- Allow slack in line to enable the nozzle to move quickly up the line.
- Once insured nozzle is in the line, distance yourself from manhole and mist.
- If equipped, use a remote control to enable distance from manhole.

#### Retracting nozzle in line

- As nozzle comes close to manhole, lower water flow and retract slowly.
- Turn off pump before retracting nozzle out of the line.

SEWER SYSTEMS

### 

Sewer gas hazard.

Sewer lines often contain poisonous or explosive gas

such as methane. NEVER enter or bend over a sewer without proper ventilation and personal protective equipment. If another person needs help in a sewer, immediately call for emergency assistance. NEVER enter the sewer to help unless you have been trained to do so and have proper personal protective equipment.

NEVER smoke in or around sewer lines, drains, or catch basins.

Failure to follow these instructions may result in death or serious injury.

### **A**WARNING

Chemical waste hazard

Many chemicals are illegally dumped

in storm drains, catch basins and sewers. To prevent contamination and injury wear chemical resistant gloves, long sleeves, trousers and safety glasses or face shields. Seek immediate medical attention if exposure or contamination is suspected.

### Observe environmental protection regulations

Be mindful of the environment and ecology.

Before draining any fluids, find out the correct way to dispose of them.

Observe the relevant environmental protection regulations when disposing of oil, fuel, coolant, brake fluid, filters, and batteries.

### **A** WARNING

**Biological hazards** 

SAFETY

Germs and other biological hazards are common in sewers. All operators must wear safety apparel: hard hat, visor and / or goggles, ear protection, rain suit, safety-toe shoes or boots with non skid soles and water proof gloves are recommended to avoid injury and contamination. Additional equipment may be required as determined by an on site safety assessment.

Immediately treat all abrasions, cuts and nicks for contamination. Get medical attention for injuries associated with cleaning sewers, drains and catch basins if biological contamination is suspected. Serious illness may result if this procedure is not followed.

### **A**WARNING

Trip, fall and other hazards

Open manholes and other access openings create risks of trips and falls. Be aware of such locations and do not step in or over them. Ensure that manhole cover and other covers are in place when job is completed. Failing to follow these precautions may cause serious injury or death.

Be aware of traffic and pedestrians on the job site. Use extreme caution while moving around the vehicle to avoid contact with moving vehicles. When moving the boom or vehicle make sure pedestrians are clear of the area. Use orange safety cones to mark the work area.







#### GLYCOL RECOVERY

SAFETY

The glycol recovery vehicle is designed for vacuuming glycol deicing fluid after it has been used on airplanes. Special air separators are located at the top of a holding tank to separate the glycol from the air stream. The Environmental Protection Agency (EPA) and the Federal Aviation Administration (FAA) regulate the use and recovery of deicing fluids. All glycol recovery vehicle operators must follow site regulations for the safe handling and transportation of deicing fluids.

Additional information on deicing fluids can be obtained from the manufacturer. Hazards from deicing fluids can include eye irritation and serious illness or death from ingestion. Prolonged breathing of fluid vapors is also harmful, and fumes may also be flammable. Consult the manufacturers Material Safety Data Sheet for more specific information.

For additional information refer to:

EPA at: <u>www.epa.gov</u> FAA at: <u>www.faa.gov</u>

#### **Tow Vehicles**

The tow vehicle must be rated for the trailer. The vehicles are rated by class based on gross vehicle weight rating (GVWR).

Light-Duty Trucks				
Class 1	GVWR 0-6,000lbs			
Class 2	GVWR 6,001-10,000lbs			
Class 3	GVWR 10,001-14,000lbs			
Medium-Duty Trucks				
Class 4	GVWR 14,001-16,000lbs			
Class 5	GVWR 16,001-19,500lbs			
Class 6	GVWR 19,501-26,000lbs			
Heavy-duty Trucks				
Class 7	GVWR 26,001-33,000lbs			
Class 8	GVWR 33,001-150,000lbs			

The tow vehicle must have a tow rating greater than the GVWR rating of the trailer even if the trailer will be towed unloaded. Typically there will be a GVWR rating decal for trailers on the tongue near the hitch.

Refer to the tow vehicle owner's manual for details.

#### Driving

Tow vehicles handle significantly different when towing. Common changes include braking distances increase, wind buffeting increases, turning radius is larger, visibility is reduced and acceleration is slower. Generally the vehicle must be driven slower. In the event there is some trailer sway let off the accelerator, do not brake or turn the steering wheel. If available gently apply the trailer brakes until trailer is stable again.

Refer to the trailer manufacturer's manual for details.

The following pages provide some common reference material for the safe use of trailers.

### 

#### **Collision Avoidance**

To avoid serious injury or death wear a safety vest with the appropriate safety symbols when working on job sites in traffic areas. Many accidents occur due to inattentive drivers and collision with cars and trucks.

### NOTICE

Everyone associated in any way with a Vactor® Mfg. product must thoroughly understand and apply the contents of this manual. It is the responsibility of the owner to train his employees in the operation and safety procedures while operating or repairing this equipment.

No one shall operate or service this Vactor Equipment until they have read and understand the operating manual. Additional copies of the manuals may be obtained from your Vactor distributor or by contacting the factory.

Please specify model and serial no(s).

### NOTICE



Consult OEM chassis and engine operation and maintenance manuals for complete details on operation.

#### TRAILER SAFETY

### NOTICE

Follow recommended safety practices while performing all work. Refer to the FS Solutions/Guzzler/Vactor/TRUVAC/Westech Safety Manual for additional information.

This manual is available at: www.vactor.com



### Tire Safety. Everything rides on it.

Protection against avoidable breakdowns and crashes. Improved vehicle handling. Better fuel economy. Increased tire life. Just a few of the reasons to take five minutes every month to check your tires. Simply use the handy checklist below, and see the reverse side for more information on tire safety.

#### **Safety Checklist**

- Check tire pressure regularly (at least once a month), including the spare.
- Inspect tires for uneven wear patterns on the tread, cracks, foreign objects, or other signs of wear or trauma. Remove bits of glass and other foreign objects wedged in the tread.
- Make sure your tire valves have valve caps.
- Check tire pressure before going on a long trip.
- Do not overload your vehicle. Check the tire information placard or owner's manual for the maximum recommended load for the vehicle.
- If you are towing a trailer, remember that some of the weight of the loaded trailer is transferred to the towing vehicle.

#### **Safety Tips**

- Slow down if you have to go over a pothole or other object in the road.
- Do not run over curbs, and try not to strike the curb when parking.

## Remember to check your tires once a month!



### NOTICE

Check unit daily making certain all decals are in place and readable. Replace as needed.

### NOTICE



Disconnect ECU and batteries before welding on unit.

Consult chassis service manual.

### There s Safety In Numbers

You can find the numbers for recommended tire pressure and vehicle load limit on the tire information placard and in the vehicle owner's manual. Tire placards are permanent labels attached to the vehicle door edge, doorpost, glove-box door, or inside of the trunk lid. Once you've located this information, use it to check your tire pressure and to make sure your vehicle is not overloaded—especially when you head out for vacation.

#### **Checking Tire Pressure**

Because tires may naturally lose air over time, it is important to check your tire pressure at least once a month. For convenience, purchase a tire pressure gauge to keep in your vehicle. Gauges can be purchased at tire dealerships, auto supply stores, and other retail outlets. Remember, the tire inflation number that vehicle manufacturers provide reflects the proper pounds per square inch (psi) when a tire is cold. To get an accurate tire pressure reading, measure tire pressure when the car has been unused for at least three hours.

Step 1:	Locate the correct tire pressure on the tire
	information placard or in the owner's manual.

- Step 2:Record the tire pressure of all tires.
- Step 3: If the tire pressure is too high in any of the tires, slowly release air by gently pressing on the tire valve with the edge of your tire gauge until you get to the correct pressure.
- Step 4: If the tire pressure is too low, note the difference between the measured tire pressure and the correct tire pressure. These "missing" pounds of pressure are what you will need to add.
- Step 5: At a service station, add the missing pounds of air pressure to each tire that is underinflated.
- Step 6: Check all the tires to make sure they have the same air pressure (except in cases in which the front and rear tires are supposed to have different amounts of pressure).

#### **Checking Tire Tread**

Tires have built-in treadwear indicators that let you know when it is time to replace your tires. These indicators are raised sections spaced intermittently in the bottom of the tread grooves. When they appear even with the outside of the tread, it is time to replace your tires. You can also test your tread with a Lincoln penny. Simply turn the penny so Lincoln's head is pointing down and insert it into the tread. If the tread doesn't cover Lincoln's head, it's time to replace your tires.

> For a free brochure visit www.nhtsa.gov or call 1-888-327-4236 DOT HS 809 362

Selected pages for reference.

Brochure available at WWW.NHTSA.COM

#### TRAILER SAFETY

#### MAINTENANCE



#### PRE-DEPARTURE SAFETY CHECKLIST

Before driving, make sure your vehicle maintenance and trailer maintenance are current. This is very important because towing puts additional stress on the tow vehicle. (Review the next section of the brochure for an overview of maintenance requirements.)

- Check and correct tire pressure on the tow vehicle and trailer.
- □ Make sure the wheel lug nuts/bolts on the tow vehicle and trailer are tightened to the correct torque.
- Be sure the hitch, coupler, draw bar, and other equipment that connect the trailer and the tow vehicle are properly secured and adjusted.
- Check that the wiring is properly connected not touching the road, but loose enough to make turns without disconnecting or damaging the wires.
- □ Make sure all running lights, brake lights, turn signals, and hazard lights are working.
- Verify that the brakes on the tow vehicle and trailer are operating correctly.
- Check that all items are securely fastened on and in the trailer.
- Be sure the trailer jack, tongue support, and any attached stabilizers are raised and locked in place.
- □ Check load distribution to make sure the tow vehicle and trailer are properly balanced front to back and side to side.
- Check side- and rear-view mirrors to make sure you have good visibility.
- Check routes and restrictions on bridges and tunnels.
- Make sure you have wheel chocks and jack stands.

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#### SAFETY TIPS FOR DRIVING WITH A TRAILER

Take time to practice before driving on main roads and never allow anyone to ride in or on the trailer. Before you leave, remember to check routes and restrictions on bridges and tunnels. Consider the following safety tips each time you drive with a trailer.

#### General Handling

- Use the driving gear that the manufacturer recommends for towing.
- Drive at moderate speeds. This will place less strain on your tow vehicle and trailer. Trailer instability (sway) is more likely to occur as speed increases.
- Avoid sudden stops and starts that can cause skidding, sliding, or jackknifing.
- Avoid sudden steering maneuvers that might create sway or undue side force on the trailer.
- Slow down when traveling over bumpy roads, railroad crossings, and ditches.
- Make wider turns at curves and corners. Because your trailer's wheels are closer to the inside of a turn than the wheels of your tow vehicle, they are more likely to hit or ride up over curbs.
- To control swaying caused by air pressure changes and wind buffeting when larger vehicles pass from either direction, release the accelerator pedal to slow down and keep a firm grip on the steering wheel.

#### Braking

- Allow considerably more distance for stopping.
- If you have an electric trailer brake controller and excessive sway occurs, activate the trailer

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brake controller by hand. Do not attempt to control trailer sway by applying the tow vehicle brakes; this will generally make the sway worse.

 Always anticipate the need to slow down. To reduce speed, shift to a lower gear and press the brakes lightly.

#### Acceleration and Passing

- When passing a slower vehicle or changing lanes, signal well in advance and make sure you allow extra distance to clear the vehicle before you pull back into the lane.
- Pass on level terrain with plenty of clearance. Avoid passing on steep upgrades or downgrades.
- If necessary, downshift for improved acceleration or speed maintenance.
- When passing on narrow roads, be careful not to go onto a soft shoulder. This could cause your trailer to jackknife or go out of control.

#### Downgrades and Upgrades

- Downshift to assist with braking on downgrades and to add power for climbing hills.
- On long downgrades, apply brakes at intervals to keep speed in check. Never leave brakes on for extended periods of time or they may overheat.
- Some tow vehicles have specifically calibrated transmission tow-modes. Be sure to use the tow-mode recommended by the manufacturer.

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#### TRAILER SAFETY

#### MAINTENANCE



#### Backing Up

- Put your hand at the bottom of the steering wheel. To turn left, move your hand left. To turn right, move your hand right. Back up slowly. Because mirrors cannot provide all of the visibility you may need when backing up, have someone outside at the rear of the trailer to guide you whenever possible.
- Use slight movements of the steering wheel to adjust direction. Exaggerated movements will cause greater movement of the trailer. If you have difficulty, pull forward and realign the tow vehicle and trailer and start again.

#### Parking

- Try to avoid parking on grades. If possible, have someone outside to guide you as you park. Once stopped, but before shifting into Park, have someone place blocks on the downhill side of the trailer wheels. Apply the parking brake, shift into Park, and then remove your foot from the brake pedal.
   Following this parking sequence is important to make sure your vehicle does not become locked in Park because of extra load on the transmission. For manual transmissions, apply the parking brake and then turn the vehicle off in either first or reverse gear.
- When uncoupling a trailer, place blocks at the front and rear of the trailer tires to ensure that the trailer does not roll away when the coupling is released.
- An unbalanced load may cause the tongue to suddenly rotate upward; therefore, before uncoupling, place jack stands under the rear of the trailer to prevent injury.

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Selected pages for reference.

Brochure available at WWW.NHTSA.COM

#### MAINTENANCE

Tow vehicles often have more frequent maintenance requirements, including changes of engine and transmission oils and filters, lubrication of components, and cooling system checks. Check your owner's manual for information on scheduled maintenance of your tow vehicle and trailer. Here are some additional maintenance suggestions.

#### Tires

Periodic inspection and maintenance of tow vehicle and trailer tires and wheels are essential to towing safety, including spare tires. Proper tire pressure affects vehicle handling and the safety of your tires. You can find the correct tire pressure for your tow vehicle in the owner's manual or on the tire information placard

- Underinflation reduces the load-carrying capacity of your tow vehicle or trailer, may cause sway and control problems, and may result in overheating, causing blowouts or other tire failure.
- Overinflation causes premature tire wear and affects the handling characteristics of the tow vehicle or trailer.

#### Brakes

On a regular basis, have the brakes on both vehicles inspected. Be sure that necessary adjustments are made and any damaged or worn parts are replaced.

#### Hitch

Check the nuts, bolts, and other fasteners to ensure that the hitch remains secured to the tow

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vehicle and the coupler remains secured to the trailer. The connection point may require periodic lubrication to permit free movement of the coupler to the hitch ball.

#### Wiring

Make sure connector-plug prongs and receptacles, lightbulb sockets, wire splices,

and ground connections are clean and shielded from moisture. Lightly coat all electrical terminal connections with nonconducting (dielectric), light waterproof grease.

Clean the prongs with very fine sandpaper, being careful not to damage the contact area.

Clean the surface deposits in the connector holes. (Make sure the lights are off to prevent blowing a fuse.) Try to clean off only the deposits and lubricate lightly with dielectric, light waterproof grease.

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TRAILER SAFETY

Additional resource



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### NOTICE



Jump Starting Or Welding Can Damage Electrical System

To avoid damage:

- Disconnect ECU, control modules and batteries before welding on unit.
- Disconnect control modules before jump starting. Consult chassis service manual for details on jump starting.
- Never use a test light when troubleshooting. Only use digital multimeter on all circuits. Test lights and older analog meters can damage the electronic systems.
- Set all ignition switches to OFF before testing CANbus system.

### NOTICE



Follow recommended safety practices while performing all work. Refer to the FS Solutions/Guzzler/Vactor/TRUVAC/Westech Safety Manual for additional information.

This manual is available at: <u>www.vactor.com</u>

#### STATIC ELECTRICITY

The owner, operator and user are responsible for determining if static grounding is required and what level of protection is required for the specific job. Due to the possibility of static electricity build up in the system we recommend grounding the unit in all applications.



Additional copies available from API Publications and Distribution: (202) 682-8375

Information about API Publications, Programs and Services is available on the World Wide Web at: http://www.api.org

American Petroleum Institute

1220 L Street, Northwest Washington, D.C. 20005-4070 202-682-8000



Typical static cable and clamp

The American Petroleum Institute provides additional resources and programs to industry which are based on API Standards. For more information, contact:

Training/Workshops	Ph: Fax:	202-682-8490 202-682-8222
Inspector Certification Programs	Ph: Fax:	202-682-8161 202-962-4739
American Petroleum Institute     Quality Registrar	Ph: Fax:	202-682-8130 202-682-8070
Monogram Program	Ph: Fax:	202-962-4791 202-682-8070
Engine Oil Licensing and Certification System		202-682-8233 202-962-4739
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In addition, petroleum industry technical, patent, and business information is available online through API EnCompass<sup>34</sup>. Call 1-888-604-1880 (toll-free) or 212-366-4040, or fax 212-366-4298 to discover more.

To obtain a free copy of the API Publications, Programs, and Services Catalog, call 202-682-8375 or fax your request to 202-962-4776. Or see the online interactive version of the catalog on our web site at www.api.org/cat.



Helping You Get The Job Done Right?

#### Available from the WJTA-IMCA:

Recommended Practices for the Use of Industrial Vacuum Equipment. Familiarize yourself with the Recommended Practices, particularly Section 2.0 Accidents & Section 5.5 Grounding/Bonding.



In addition, NFPA 77 Recommended Practice on Static Electricity provides more detailed grounding methods. This can be obtained from the National Fire Protection Association at www.NFPA.org (800-344-3555).

These three references are recommended to help in making good decisions in the proper use of vacuum truck technology. Other references are also available.

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Avoiding static ignition hazards in chemical operations / Laurence G. Britton. p. cm. — (A CCPS concept book) Includes bibliographical references and index. ISBN 0-8169-0800-1 1. Electrostatics. 2. Chemical plants—Safety measures. I. Title. II. Series TP155.5.B75 1999 99-35855 660'.2804—dc21
### **DUST - HANDLING SAFETY**

If use of Vactor equipment results in exposure to potentially hazardous dust, employers and users should consult any applicable SDS as well as OSHA regulations, guidelines, and information to ensure safety of operators. Under these circumstances, users should pay particular attention to possible increased exposure when dumping debris hoppers and changing bag filters. Wearing appropriate respirator during dumping operations and wetting down filter bags before service or removal may reduce exposure to certain dusts such as silica dust. To reduce exposure in presence of potentially hazardous dusts, employers should consider use of upgraded filters, broken bag detectors, and ensure that any leaking gaskets and seals are promptly serviced. Employers should monitor exposure of operators and ensure compliance with applicable OSHA regulations and standards.

Some common practices to reduce exposure include:

- 1. Upgrading filters
- 2. Servicing gaskets and seals if leaking
- 3. Wetting down filter bags, if appropriate before servicing or removal.
- 4. Operators wearing appropriate respirators when servicing, dumping or during air excavation.

#### Combustible dusts

Materials that are, or could produce, combustible dusts must be handled in such a way as to prevent combustible dust explosions and deflagrations (fires).

Combustible dusts consist of the following dust types as per NFPA 70: National Electrical Code 2014 Edition

- Group E Metallic Dusts
- Group F Carbonaceous Dusts
- Group G Organic Dusts

It is the responsibility of the owner to insure that all of the following steps are taken before using any air mover unit on combustible dust materials.

- All employees involved in handling combustible dusts must be trained as to the combustible dust hazards as part of their HAZCOM training. See: OSHA 3371-08 2009 - Hazard Communication Guidance for Combustible Dusts
- 6. Consult the SDS(s) of the material(s) for the recommended Safe Handling Procedures and Fire and Explosion potentials.
- 7. Dry materials and low relative humidity increase the dangers of handling combustible dusts.
- 8. Never dry sweep or *Blow Down* the dusts with compressed air to form piles for easier vacuum removal. Both of these methods can create conditions for a dust explosion to occur.
- 9. Position the air mover so that the top baghouse doors, which are the emergency relief vent in the event of an explosion, do not create a greater hazard should an explosion occur within the unit. Keep all personnel clear of the baghouse and cyclone clean out doors which may also vent should an explosion occur.
- 10. The air mover itself contains many possible exterior ignition sources (electrical and heat). Never operate the unit in an area containing airborne combustible dust.
- 11. Insure the grounding cable on the unit is properly mounted, bare metal bottom of the grounding reel to bare metal mounting surface on either the frame or bed of the unit, and that the grounding cable and clamp are in good condition.

### DUST - HANDLING SAFETY

- 12. Ground the unit to an approved grounding point or grounding rod. If using a grounding rod(s), it must be designed for grounding and driven firmly into the soil per the site requirements. The grounding point should be wire brushed to remove oxidation or other materials that might prevent the free flow of electricity.
- 13. For rear loading air movers, a rubber baffle placed over the diverter plate is strongly recommended to prevent any potential metal to metal contact during vacuuming. This is essential when vacuuming metal combustible dusts.
- 14. All components of the vacuum line must be bondable. This includes: nozzle, hoses, pipes, fittings, safety tee, trunk hose.
- 15. Never use any non-conductive materials in any part of the vacuum line (PVC Pipe or Plastic Hose).
- 16. Never use bare copper wire inside or outside of the vacuum line as a jumper across non-conductive components.
- 17. Rubber hoses must include a continuous wire helical stiffener. The wire should be stripped 4-6" on each end of the hose, the bared wire pushed into the hose opening and then the metal hose shanks pressed in to the hoses and clamped together.

- All bonds and grounds must be tested with a suitable Ohm meter to verify the bonding and grounding meet the site requirements.
- 19. Do not restrict the air flow to the unit to prevent overheating of the blower. Restricting the air flow could cause the blower to become an ignition source for dusts. Use multiple smaller hoses if a larger hose is not practical.
- 20. Run the unit at the lowest RPM that moves the material. Excess RPM's create excess heat in the blower.
- 21. If the unit begins to blow dust from the discharge silencer, immediately shut the unit down, disconnect the vacuum line, repair any broken or unseated bags in the bag house, rinse any dust out of the silencer, clean or purge any dust remaining in the unit between the top of the bag house and the blower and finally reconnect the vacuum line and resume work. Failure to do so could result in a dust explosion.
- 22. Upon completion of the job, insure the air mover has been cleaned of any combustible dust residue.

### DUST - RESOURCES

Vactor can not possibly, know, evaluate, and advise the service trade of all conceivable ways in which operation or service might be done or the possible hazardous consequences of each way. Anyone who uses operational procedures, service procedures, or tools, whether recommended by Vactor or not, must first satisfy himself thoroughly that neither his safety nor the product safety will be jeopardized by the methods he shall select.

Vactor vacuum systems are designed to user specifications. The owner/ operator/user is responsible for the safe use and application of this equipment and proper waste disposal. Transportation and disposal of waste may be subject to local, state or federal laws.

There is an increased risk of fire and/or explosion from combustible dust. The following section provides resources will assist in solving those issues.

#### **General Information**

- FM Global, "Prevention and Mitigation of Combustible Dust Explosions and Fire", Data Sheet No. 7-76, January 2005.
- Eckhoff, Rolf K. "Dust Explosions in the Process Industries," 3rd Edition, Gulf Professional Publishing, 2003.
- Bartknecht, W. "Dust Explosions: Course, Prevention, and Protection," Springer- Verlag, 1989.



OPERATION



An online refresher course, OSHA's Combustible Dust National Compliance Directive, is available through Federal Signal. The course can be accessed at the following web address:

www.fssolutionsgroup.com/Training/OnlineCourses/ tabid/115/Default.aspx

- Hatwig, M., and Steen, H. (eds.), "Handbook of Explosion Prevention and Protection," Wiley-VCH, 2004.
- Frank, Walter. "Dust Explosion Prevention and the Critical Importance of Housekeeping," Process Safety Progress, vol. 23, no. 3, September 2004, pp. 175-184.
- Amyotte, P., Kahn, F., and Dastidar, A. "Reduce Dust Explosions the Inherently Safer Way," Chemical Engineering Progress, vol. 99, no. 10, October 2003, pp. 36-43.
- Ebidat, Vahid. "Is Your Dust Collection System an Explosion Hazard?" Chemical Engineering Progress, vol. 99, no. 10, October 2003, pp. 44-49.
- Center for Chemical Process Safety (CCPS). "Guidelines for Safe Handling of Powders and Bulk Solids." CCPS, American Institute for Chemical Process Safety, New York, New York, January 2005.

#### Code of Federal Regulations (CFR) [Standards]

U.S. Government Printing Office 732 N. Capitol Street, NW Washington, DC 20401 Telephone: 1-866-512-1800 (toll-free) OSHA Standards, Interpretations, and Publications U.S. Department of Labor/OSHA OSHA Publications Office 200 Constitution Ave., NW, N-3101 Washington, DC 20210 Telephone: (202) 693-1888 or by Fax: (202) 693-2498

#### Related OSHA standards found in 29 CFR:

1910.22 - General Requirements: Housekeeping

1910.94 - Ventilation

1910.107 - Spray Finishing Using Flammable and Combustible Materials

### **DUST - RESOURCES**

### OPERATION

<b>National Fire</b>	Protection	Association	(NFPA)
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1 Batterymarch Park Quincy, MA 02169-7471 Telephone: (800) 344-3555

Related NFPA Standards:

- NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
- NFPA 68, Guide for Venting of Deflagrations
- NFPA 69, Standard on Explosion Prevention Systems
- NFPA 70, National Electrical Code 2014 Edition
- NFPA 91, Standard for Exhaust Systems for Air Conveying of Vapors, Gases, Mists, and Noncombustible Particulate Solids
- NFPA 120, Standard for Fire Prevention and Control in Metal/Nonmetal Mining and Metal Mineral Processing Facilities
- NFPA 432, Code for the Storage of Organic Peroxide Formulations
- NFPA 480, Standard for the Storage, Handling, and Processing of Magnesium Solids and Powders
- NFPA 481, Standard for the Production, Processing, Handling, and Storage of Titanium
- NFPA 482, Standard for the Production, Processing, Handling, and Storage of Zirconium
- NFPA 484, Standard for Combustible Metals, Metal Powders, and Metal Dusts
- NFPA 485, Standard for the Storage, Handling, Processing, and Use of Lithium Metal
- NFPA 495, Explosive Materials Code
- NFPA 499, Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas
- NFPA 505, Fire Safety Standard for Powered Industrial Trucks Including Type Designations, Areas of Use, Conversions, Maintenance, and Operation
- NFPA 560, Standard for the Storage, Handling, and Use of Ethylene Oxide for Sterilization and Fumigat
- NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 655, Standard for Prevention of Sulfur Fires and Explosions
- NFPA 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
- NFPA 1124, Code for the Manufacture, Transportation, Storage, and Retail Sales of Fireworks and Pyrotechnic Articles
- NFPA 1125, Code for the Manufacture of Model Rocket and High Power Rocket Motors







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# **OSHA®FactSheet**

# Hazard Alert: Combustible Dust Explosions

Combustible dusts are fine particles that present an explosion hazard when suspended in air in certain conditions. A dust explosion can be catastrophic and cause employee deaths, injuries, and destruction of entire buildings. In many combustible dust incidents, employers and employees were unaware that a hazard even existed. It is important to determine if your company has this hazard, and if you do, you must take action now to prevent tragic consequences.

#### **How Dust Explosions Occur**

In addition to the familiar fire triangle of oxygen, heat, and fuel (the dust), dispersion of dust particles in sufficient quantity and concentration can cause rapid combustion known as a deflagration. If the event is confined by an enclosure such as a building, room, vessel, or process equipment, the resulting pressure rise may cause an explosion. These five factors (oxygen, heat, fuel, dispersion, and confinement) are known as the "Dust Explosion Pentagon". If one element of the pentagon is missing, an explosion cannot occur.

#### **Catastrophic Secondary Explosions**

An initial (primary) explosion in processing equipment or in an area where fugitive dust has accumulated may dislodge more accumulated dust into the air, or damage a containment system (such as a duct, vessel, or collector). As a result, if ignited, the additional dust dispersed into the air may cause one or more secondary explosions. These can be far more destructive than a primary explosion due to the increased quantity and concentration of dispersed combustible dust. Many deaths in past incidents, as well as other damage, have been caused by secondary explosions.

Initial Explosion

#### Secondary Explosion





A pharmaceutical plant after a dust explosion.

#### **Industries at Risk**

Combustible dust explosion hazards exist in a variety of industries, including: agriculture, chemicals, food (e.g., candy, sugar, spice, starch, flour, feed), grain, fertilizer, tobacco, plastics, wood, forest, paper, pulp, rubber, furniture, textiles, pesticides, pharmaceuticals, tire and rubber manufacturing, dyes, coal, metal processing (e.g., aluminum, chromium, iron, magnesium, and zinc), recycling operations, fossil fuel power generation (coal), and additive manufacturing and 3D printing.

#### **Prevention of Dust Explosions**

To identify factors that may contribute to a explosion, OSHA recommends a thorough hazard assessment of:

- · All materials handled;
- · All operations conducted, including by-products;
- All spaces (including hidden ones); and
- · All potential ignition sources.

#### **Dust Control Recommendations**

- Implement a hazardous dust inspection, testing, housekeeping, and control program;
- · Use proper dust collection systems and filters;
- Minimize the escape of dust from process equipment or ventilation systems;
- Use surfaces that minimize dust accumulation and facilitate cleaning;
- Provide access to all hidden areas to permit inspection;
- Inspect for dust residues in open and hidden areas at regular intervals;
- If ignition sources are present, use cleaning methods that do not generate dust clouds;
- Use only vacuum cleaners approved for dust collection; and
- · Locate relief valves away from dust deposits.

#### **Ignition Control Recommendations**

- Use appropriate electrical equipment and wiring methods;
- Control static electricity, including bonding of equipment to ground;
- · Control smoking, open flames, and sparks;
- Control mechanical sparks and friction;
- Use separator devices to remove foreign materials capable of igniting combustibles from process materials;
- · Separate heated surfaces from dusts;
- · Separate heating systems from dusts;
- · Select and use industrial trucks properly;
- Use cartridge-activated tools properly; and
- · Use an equipment preventive maintenance program.

#### **Injury and Damage Control Methods**

- Separation of the hazard (isolate with distance);
- · Segregation of the hazard (isolate with a barrier);
- Deflagration isolation/venting;
- · Pressure relief venting for equipment;
- · Direct vents away from work areas;
- · Specialized fire suppression systems;
- · Explosion protection systems;

- Spark/ember detection for suppression activation;
- Develop an emergency action plan; and
- Maintain emergency exit routes.

#### **Applicable OSHA Requirements Include:**

- §1910.22 Housekeeping
- §1910.307 Hazardous Locations
- §1910.1200 Hazard Communication
- §1910.269 Electric Power Generation, Transmission and Distribution (coal handling)
- §1910.272 Grain Handling Facilities
- General Duty Clause, Section 5(a)(1) of the Occupational Safety and Health Act (Employers must keep workplaces free from recognized hazards likely to cause death or serious physical harm).

#### Resources

Readily available from www.osha.gov are:

- Combustible Dust National Emphasis Program
- Safety and Health Information Bulletin (SHIB) (07-31-2005) Combustible Dust in Industry: Preventing and Mitigating the Effects of Fires and Explosions

See the SHIB or www.osha.gov for other applicable standards.

The primary National Fire Protection Association (NFPA) consensus standards related to this hazard are:

- NFPA 654, Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids
- NFPA 61, Standard for the Prevention of Fires and Dust Explosions in Agricultural and Food Processing Facilities
- NFPA 484, Standard for Combustible Metals
- NFPA 664, Standard for the Prevention of Fires and Explosions in Wood Processing and Woodworking Facilities
- NFPA 655, Standard for the Prevention of Sulfur Fires and Explosions
- · See www.nfpa.org to view NFPA standards.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.



www.osha.gov (800) 321-OSHA (6742)

DSG FS-3791 05/2015



U.S. Department of Labo

### OPERATION

# **OSHA Fact**Sheet



# **OSHA's Respirable Crystalline Silica** Standard for Construction

Workers who are exposed to respirable crystalline silica dust are at increased risk of developing serious silica-related diseases. OSHA's standard requires employers to take steps to protect workers from exposure to respirable crystalline silica.

#### What is Respirable Crystalline Silica?

Crystalline silica is a common mineral that is found in construction materials such as sand, stone, concrete, brick, and mortar. When workers cut, grind, drill, or crush materials that contain crystalline silica, very small dust particles are created. These tiny particles (known as "respirable" particles) can travel deep into workers' lungs and cause silicosis, an incurable and sometimes deadly lung disease. Respirable crystalline silica also causes lung cancer, other potentially debilitating respiratory diseases such as chronic obstructive pulmonary disease, and kidney disease. In most cases, these diseases occur after years of exposure to respirable crystalline silica.

# How are Construction Workers Exposed to Respirable Crystalline Silica?

Exposure to respirable crystalline silica can occur during common construction tasks, such as using masonry saws, grinders, drills, jackhammers and handheld powered chipping tools; operating vehiclemounted drilling rigs; milling; operating crushing machines; using heavy equipment for demolition or certain other tasks; and during abrasive blasting and tunneling operations. About two million construction workers are exposed to respirable crystalline silica in over 600,000 workplaces.

#### What Does the Standard Require?

The standard (29 CFR 1926.1153) requires employers to limit worker exposures to respirable crystalline silica and to take other steps to protect workers. Employers can either use a control method laid out in Table 1 of the construction standard, or they can measure workers' exposure to silica and independently decide which dust controls work best to limit exposures in their workplaces to the permissible exposure limit (PEL).

#### What is Table 1?

Table 1 matches 18 common construction taskswith effective dust control methods, such as usingwater to keep dust from getting into the air or usinga vacuum dust collection system to capture dust. In

some operations, respirators may also be needed. Employers who follow Table 1 correctly are not required to measure workers' exposure to silica from those tasks and are not subject to the PEL.

#### **Table 1 Example: Handheld Power Saws**

If workers are sawing silica-containing materials, they can use a saw with a built-in system that applies water to the saw blade. The water limits the amount of respirable crystalline silica that gets into the air.

Table 1: Specified Exposure Control MethodsWhen Working With Materials ContainingCrystalline Silica

	Engineering and	Required Respiratory Protection and Minimum Assigned Protection Factor (APF)	
Equipment/ Task	Work Practice Control Methods	≤ 4 hrs/ shift	> 4 hrs/ shift
Handheld power saws (any blade diameter)	Use saw equipped with integrated water delivery system that continuously feeds water to the blade. Operate and maintain tool in accordance with manufacturer's instructions to minimize dust emissions. • When used outdoors. • When used indoors or in an enclosed area.	None APF 10	APF 10 APF 10

Excerpt from Table 1 in 29 CFR 1926.1153

In this example, if a worker uses the saw outdoors for four hours or less per day, no respirator would be needed. If a worker uses the saw for more than four

### Operation

hours per day or any time indoors, he or she would need to use a respirator with an assigned protection factor (APF) of at least 10, such as a NIOSH-certified filtering facepiece respirator that covers the nose and mouth (sometimes referred to as a dust mask). See the respiratory protection standard (29 CFR 1910.134) for information on APFs.

#### **Alternative Exposure Control Methods**

Employers who do not fully implement the control methods on Table 1 must:

- Determine the amount of silica that workers are exposed to if it is, or may reasonably be expected to be, at or above the action level of 25 µg/m<sup>3</sup> (micrograms of silica per cubic meter of air), averaged over an 8-hour day;
- Protect workers from respirable crystalline silica exposures above the PEL of 50 µg/m<sup>3</sup>, averaged over an 8-hour day;
- Use dust controls and safer work methods to protect workers from silica exposures above the PEL; and
- Provide **respirators** to workers when dust controls and safer work methods cannot limit exposures to the PEL.

#### What Else Does the Standard Require?

Regardless of which exposure control method is used, all construction employers covered by the standard are required to:

- Establish and implement a written exposure control plan that identifies tasks that involve exposure and methods used to protect workers, including procedures to restrict access to work areas where high exposures may occur;
- Designate a competent person to implement the written exposure control plan;
- Restrict housekeeping practices that expose workers to silica, such as use of compressed air without a ventilation system to capture the dust and dry sweeping, where effective, safe alternatives are available;
- Offer medical exams—including chest X-rays and lung function tests—every three years for workers who are required by the standard to

wear a respirator for 30 or more days per year;

- Train workers on the health effects of silica exposure, workplace tasks that can expose them to silica, and ways to limit exposure; and
- Keep records of workers' silica exposure and medical exams.

#### Additional Information

Additional information on OSHA's silica standard can be found at www.osha.gov/silica.



Applying water to the blade of a handheld power saw reduces the amount of dust created when cutting.

OSHA can provide compliance assistance through a variety of programs, including

technical assistance about effective safety and health programs, workplace consultations, and training and education.

OSHA's On-Site Consultation Program offers free, confidential occupational safety and health services to small and medium-sized businesses in all states and several territories across the country, with priority given to high-hazard worksites. On-Site consultation services are separate from enforcement and do not result in penalties or citations. Consultants from state agencies or universities work with employers to identify workplace hazards, provide advice on compliance with OSHA standards, and assist in establishing and improving safety and health management systems. To locate the OSHA On-Site Consultation Program nearest you, call 1-800-321-OSHA or visit www.osha.gov/consultation.

#### **How to Contact OSHA**

Under the Occupational Safety and Health Act of 1970, employers are responsible for providing safe and healthful workplaces for their employees. OSHA's role is to ensure these conditions for America's working men and women by setting and enforcing standards, and providing training, education and assistance. For more information, visit www.osha.gov or call OSHA at 1-800-321-OSHA (6742), TTY 1-877-889-5627.

This is one in a series of informational fact sheets highlighting OSHA programs, policies or standards. It does not impose any new compliance requirements. For a comprehensive list of compliance requirements of OSHA standards or regulations, refer to Title 29 of the Code of Federal Regulations. This information will be made available to sensory-impaired individuals upon request. The voice phone is (202) 693-1999; teletypewriter (TTY) number: (877) 889-5627.



### Hydro-Excavation - Getting Started

Vactor

#### Vacuum Excavation occurs when high-pressure water or pressurized air breaks up and cuts the soil, while a high-flow vacuum system lifts the soil up and out of the excavation area.

Buried natural gas, petroleum pipelines, and water mains can be quickly and efficiently uncovered with greatly reduced risk of strike. Fiber optic lines, cables, and other utilities can be efficiently located without the damage that can happen with traditional mechanical digging.

Operators can dig with precision, establishing a less invasive method for slot trenching, pot holing, and pipe location.

This manner of excavation causes less surface damage, reduces disruption of traffic and other surface activities and can be easier and less expensive to repair.

Non-destructive vacuum excavation has quickly gaining acceptance by cities, utilities, and contractors as a relatively safe, effective alternative to traditional excavation methods in a wide range of applications such as line location, installation and repair for utilities and pipelines, sewer and pipe, rehabilitation, slot trenching, waterline maintenance and repair, directional digging, excavation in congested areas, sign and pole installation, landscaping excavation and precision digging.

The following pages provide basic resources to plan and operate a hydro-excavation digging site safely.

Follow all federal, state, and local regulations for locating utilities before starting work.

# **WARNING**

High pressure water

High pressure water can cause serious injury or death.

The handgun operates under high pressure. Never point the handgun at another individual. Severe injury can result from the high-pressure water.

Special safety equipment is required when operating the high-pressure handgun. Always wear safety toe shoes or boots (waterproof shoes or boots preferred), coveralls, face shield and safety goggles and gloves (waterproof gloves preferred).





marked AND helps protect you from injury and expense. Safe Digging Is No Accident: Always Call 811 Before You Dig



OPERATION

Always Call 811 Before You Dig Know what's below. Always call 811 before you dig. Visit call 811.com for more information.

# Do Not Enter an Unprotected Trench!



#### For your safety:

- Slope or bench trench walls, or
- Shore trench walls with supports, or
- Shield trench walls with trench boxes.
- Provide safe access through the use of ladders, ramps or stairways.
- Keep heavy equipment away from trench edges.
- Know where underground utilities are prior to digging.
- Keep excavated or other materials at least 2 feet back from the edge of trench.

OSHA's role is to assure the safety and health of workers by setting and enforcin standards; providing training, outreach and education; establishing partnerships and encouraging continual improvement in workplace safety and health.



U.S. Department of Labor To get more information, report an emergency or contact your local office: www.csha.gov • (800) 321-OSHA • TTY (877) 889-5627

### HYDRO-EXCAVATION - RESOURCES

OPERATION

The AEM is a leading provider of training and safety material.



Association of Equipment Manufacturers 6737 West Washington Street Suite 2400 Milwaukee, WI 53214-5647

414.272.0943 Fax: 414.272.1170 Email aem@aem.org website: www.aem.org



Operators using or working around high pressure water systems need to take additional precautions including specialized personal protection equipment. Additional information on high pressure water safety is available from the WJTA.

#### Also available from the WJTA:

Recommended Practices for the Use of High Pressure Waterjetting Equipment

Recommended Practices for the Use of Industrial Vacuum Equipment



WaterJet Technology Association 917 Locust Street, Suite 1100 St Louis MO 63101-1419

314-241-1445 Fax 314-241-1449 e-mail: wjta@wjta.org website: www.wjta.org



INDUSTRY BEST PRACTICES FOR THE USE OF HIGH PRESSURE WATERJETTING EQUIPMENT



RECOMMENDED PRACTICES FOR THE USE OF INDUSTRIAL VACUUM EQUIPMENT POURTH EDITION, JAKY 2020

Underground power lines may require special precautions including cutting power to the lines and the use of special protective bonding equipment.

Kri-Tech is a source of protective bond mats used during hydro-excavation:



**Kri-Tech Products Ltd.** Box 364, Mirror Alberta Canada T0B 3C0

877-788-3883 Fax: 403-788-3723 Email: info@kri-tech.net website: www.kri-tech.net

### HYDRO-EXCAVATION - RESOURCES



**Common Ground Alliance** 2300 Wilson Boulevard Suite 400 Arlington, Virginia 22201

703-836-1709 Fax: 309-407-2244 websites: www.commongroundalliance.com www.call811.com www.cga-dirt.com







#### **Ontario Regional Common Ground Alliance**

195 King Street, Suite 105 St Catharines, Ontario L2R 3J6

866-446-4493 Fax: 866-838-6739 Email: office@orga.com website: www.orcga.com





Work Safe for Life

**Centre for Health and Safety Innovation** 5110 Creekbank Road, Suite 400 Mississauga, ON L4W 0A1

800-263-5024 Fax: 905-625-8998 Email: info@ihsa.ca website: www.ihsa.ca



1-877-ESA-SAFE 1-877-372-7233 Customer Service Center

website: www.esasafe.com



### Vactor Personal Protection Equipment - PPE

Follow all requirements for PPE when operating and servicing. The Occupational Safety and Health Administration (OSHA) requirements apply to most workers. The following information is from OSHA 3151-12R 2003. The full document can be obtained from www.osha.gov.

A hazard assessment should be made to determine the correct level of footwear safety protection. Underground electrical utilities may require the use of insulating gloves and dielectric footwear. The minimum requirements for gloves are compliant with OSHA 1910.137, OSHA 1910.268, NFPA 70E and exceeds the ASTM D120 and European EN60903 standards. Refer to NFPA 70E for dielectric footwear.

National Fire Protection Association (NFPA)

1 Batterymarch Park Quincy, MA 02169-7471 Telephone: (800) 344-3555

# NOTICE

Reference to OSHA regulations are for informational purposes only and not intended as legal advice.



ASTM Labeling Chart Natural Rubber Electrical Insulating Gloves					
Class Color	Proof Test Voltage AC/DC	Max. Use Voltage AC/DC	Insulating Rubber Glove Label		
00 Beige	2,500 / 10,000	500 / 750	10 ASTM D120 ENKORGO CLASS 00 TYPE I MAX USE VOLT SOV AC		
0 Red	5,000 / 20,000	1,000 / 1,500	10 ASTM D120 EN60600 CLASS D TYPE I MOX USE VOLT 100V AC		
1 White	10,000 / 40,000	7,500 / 11,250	10 ASTM D120 EN60503 CLASS 1 TYPE I MAX USE VOLT 7200V AC		
2 Yellow	20,000 / 50,000	17,000 / 25,500	10 ASTM D120 EN60803 CLASS 2 TYPE I MAX USE VOLT 17009V AN		
3 Green	30,000 / 60,000	26,500 / 39,750	10 ASTM D125 ENe0203 CLASS 3 TYPE I MAX USE VOLT 28000V A		
4 Orange	40,000 / 70,000	36,000 / 54,000	10 ASTM D120 EN60503 GLASS 4 TYPE I MAX USE VOLT SECOSY AC		

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# Vactor

### HYDRO-EXCAVATION - SITE PREPARATION

Refer to the Vactor/Guzzler/TRUVAC/Westec Safety Manual for general site preparation. Site specific regulations may also apply.

- 1. Call 811 before all digging operations to locate and mark off all known utilities
- 2. All buried utilities suspected to be damaged must be de energized prior to digging.
- 3. Follow all recommended procedures for electrical bonding. Ground mats may be required.
- Verify all equipment is in safe working order and suitable for the work to be performed. Water flows above 10gpm are normally not suitable due to the higher risk of erosion problems.
- 5. The working end of the vacuum tube should be equipped with a soft nonconductive end to help reduce the risk of contact or damage to buried lines and pipes.
- 6. Water pressure, volume and temperature can have a big impact on the risk of damaging the various underground utilities. Some testing may be required to avoid damage. Lower the water pressure and temperature when getting close to the utilities. The water nozzles must always be in motion.
- 7. Teamwork is very important when trenching and digging large holes. One person is operating the wand or hand gun. The other person is positioning the boom so the vacuum tube is in the right position to move the material as soon as it breaks away. It is not productive to try to wash the material to the nozzle or to try to vacuum the material a great distance to the nozzle.

The operational systems on the units are dependent upon the options and capacities of the vehicle as ordered. The vehicle is custom designed to provide a combination of high-pressure water and suction to perform in a designated area and application. The water, hydraulic and vacuum systems work together to provide a powerful excavating machine.

It is important to remember that the vacuum tube uses air flow and not vacuum to pick up material. Keep the suction end of the nozzle in the upright position to receive air and material. Submerging the nozzle in material stops airflow, prevents material movement and creates a loading and unloading effect on the blower/fan. The nozzle is designed to



# Know what's **below. Call before you dig.**

# **WARNING**

**Underground hazards** 

Gas and electrical utility damage can result in fire, explosion and electrocution. To avoid injury or death:

- Before digging locate all underground utilities. Always call 811 before digging.
- Shut off gas lines and electrical power
- Always use nozzles designed for excavating applications to reduce the risk of damage.



pull air into the pipe to move material. The end is serrated with small holes; if the end is submerged no air is pulled in through the holes.

### CONFINED SPACE

SAFETY

Follow all requirements for confined space when servicing. All debris body, large water bodies and vessels that can be entered may be considered permit-required confined space as defined by the Occupational Safety and Health Administration (OSHA). The following information is from OSHA 3138-01R 2004. The full document can be obtained from www.osha.gov.

Many workplaces contain spaces that are considered to be "confined" because their configurations hinder the activities of employees who must enter into, work in or exit from them. In many instances, employees who work in confined spaces also face increased risk of exposure to serious physical injury from hazards such as entrapment, engulfment and hazardous atmospheric conditions. Confinement itself may pose entrapment hazards and work in confined spaces may keep employees closer to hazards such as machinery components than they would be otherwise. For example, confinement, limited access and restricted airflow can result in hazardous conditions that would not normally arise in an open workplace.

The terms "permit-required confined space" and "permit space" refer to spaces that meet OSHA's definition of a "confined space" and contain health or safety hazards. For this reason, OSHA requires workers to have a permit to enter these spaces. Throughout this publication, the term "permit space" will be used to describe a "permit-required confined space."

#### Definitions

By definition, a confined space:

- Is large enough for an employee to enter fully and perform assigned work;
- Is not designed for continuous occupancy by the employee; and
- Has a limited or restricted means of entry or exit.

These spaces may include underground vaults, bodies, storage bins, pits and diked areas, vessels, silos and other similar areas.



All units are equipped with a tie off point for entering the debris body. It is normally located on the driver side next to the rear door.

# NOTICE

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By definition, a permit-required confined space has one or more of these characteristics:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains a material with the potential to engulf someone who enters the space;
- Has an internal configuration that might cause an entrant to be trapped or asphyxiated by inwardly converging walls or by a floor that slopes downward and tapers to a smaller cross section; and/or
- Contains any other recognized serious safety or health hazards.



### **TRENCHING/DIGGING**





SAFETY

# Know what's **below**. **Call** before you dig.

Follow all federal, state, and local regulations for locating utilities before starting work.





# **Do Not Enter** an Unprotected Trench!



Know what's below. Always call 811 before you dig. Visit call811 com for more information



role is to assure the safety and health of workers by setting and enforcing rds; providing training, outreach and education; establishing partnerships; d encouraging continual improvement in workplace safety and health.



To get more information, report an emergency or contact your local office www.osha.gov • (800) 321-OSHA • TTY (877) 889-5627

#### For your safety:

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TRENCHING



# NOTICE

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SAFETY



### FALL PROTECTION

SAFETY

Some service steps require being on top of the unit. Follow all requirements for fall protection when working around mobile equipment. The Occupational Safety and Health Administration (OSHA) requirements apply to most workers. The following information is from OSHA 3146 1998 (revised). The full document can be obtained from www.osha.gov.

In the construction industry in the U.S., falls are the leading cause of worker fatalities. Each year, on average, between 150 and 200 workers are killed and more than 100,000 are injured as a result of falls at construction sites. OSHA recognizes that accidents involving falls are generally complex events frequently involving a variety of factors. Consequently, the standard for fall protection deals with both the human and equipment-related issues in protecting workers from fall hazards. For example, employers and employees need to do the following:

- Where protection is required, select fall protection systems appropriate for given situations.
- Use proper construction and installation of safety systems.
- Supervise employees properly.
- Use safe work procedures.
- Train workers in the proper selection, use, and maintenance of fall protection systems.

# NOTICE

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All units are equipped with a tie off point for entering the debris body.

Where needed units are equipped with additional designated tie off points. Only use these tie off points for fall protection. If no tie off point is marked as shown then an independent tie off system must be used.

### LOCKOUT / TAGOUT

SAFETY

Follow all requirements for lockout/tagout when servicing. The Occupational Safety and Health Administration (OSHA) requirements apply to most workers. The following information is from OSHA 3120 2002 (revised). The full document can be obtained from www.osha.gov.

"Lockout/tagout" refers to specific practices and procedures to safeguard employees from the unexpected energization or startup of machinery and equipment, or the release of hazardous energy during service or maintenance activities.1 This requires, in part, that a designated individual turns off and disconnects the machinery or equipment from its energy source(s) before performing service or maintenance and that the authorized employee(s) either lock or tag the energy-isolating device(s) prevent the release of hazardous energy and take steps to verify that the energy has been isolated effectively. If the potential exists for the release of hazardous stored energy or for the reaccumulation of stored energy to a hazardous level, the employer must ensure that the employee(s) take steps to prevent injury that may result from the release of the stored energy.

Lockout devices hold energy-isolation devices in a safe or off" position. They provide protection by preventing machines or equipment from becoming energized because they are positive restraints that no one can remove without a key or other unlocking mechanism, or through extraordinary means, such as bolt cutters. Tagout devices, by contrast, are prominent warning devices that an authorized employee fastens to energy-isolating devices to warn employees not to reenergize the machine while he or she services or maintains it. Tagout devices are easier to remove and, by themselves, provide employees with less protection than do lockout devices.

Why do I need to be concerned about lockout/ tagout?

Employees can be seriously or fatally injured if machinery they service or maintain unexpectedly energizes, starts up, or releases stored energy. OSHA's standard on the Control of Hazardous Energy (Lockout/Tagout), found in Title 29 of the Code of Federal Regulations (CFR) Part 1910.147, spells out the steps employers must take to prevent accidents associated with hazardous energy. The standard addresses practices and procedures necessary to disable machinery and prevent the release of potentially hazardous energy while maintenance or servicing activities are performed.

# NOTICE

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### **PERSONAL PROTECTION EQUIPMENT - PPE**

SAFETY

Follow all requirements for PPE when operating and servicing. The Occupational Safety and Health Administration (OSHA) requirements apply to most workers. The following information is from OSHA 3151-12R 2003. The full document can be obtained from www.osha.gov.

A hazard assessment should be made to determine the correct level of footwear safety protection. Underground electrical utilities may require the use of insulating gloves and dielectric footwear. The minimum requirements for gloves are compliant with OSHA 1910.137, OSHA 1910.268, NFPA 70E and exceeds the ASTM D120 and European EN60903 standards. Refer to NFPA 70E for dielectric footwear.

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00 Beige	2,500 / 10,000	500 / 750	10 ASTM DI20 EN60560 CLASS 50 TYPE I MAK USE VOLT SOOV AC			
0 Red	5,000 / 20,000	1,000 / 1,500	10 ASTM D120 EN00903 CLASS TYPE I MOV USE VOLT 100V AC			
1 White	10,000 / 40,000	7,500 / 11,250	10 ASTM D120 EN00903 CLASS 1 TYPE I MAX USE VOLT 7500V AC			
2 Yellow	20,000 / 50,000	17,000 / 25,500	10 ASTM D120 EN60900 CLASS 2 TYPE 2 MAX USE VOLT 17700V AC			
3 Green	30,000 / 60,000	26,500 / 39,750	10 ASTM D120 EN60203 GLASS 3 TYPE 1 MAXE USE VOLT 26000V AG			
4 Orange	40,000 / 70,000	36,000 / 54,000	10 ASTM D120 EN60503 CLASS 4 TYPE I MAX USE VOLT SECON AC			

### **CROSS CONTAMINATION HAZARDS**

Before and after all work serious issues need to be addressed which include:

- Has the unit been thoroughly cleaned? 1.
- 2. Will any of the debris react with any of the components of the unit?
- 3. Has the debris been positively identified?
- In the case of a spill, there may be cross 4. contamination issues with material soaked into the surrounding area.

#### Cleaning

The owner, operator and user are responsible for determining what level of cleaning is required for the specific job due to the possibility of cross contamination of chemicals. Two common resources for information are shown here for reference.

Things to consider when cleaning:

- 1. Visually inspect the debris body, cyclone(s), baghouse(s) and all material flow paths. They should be clean and clear of all visible debris and should be dry.
- 2. Replace all filter media in the debris path.
- 3. Disassemble and clean all filter screens and hoses.
- 4. Dispose of all waste in accordance with federal, state, and local laws and regulations.
- Maintain an MSDS/SDS for all materials the 5. units is used for.
- 6. A procedure should be developed and strictly followed to track the last material the unit was used for and cleaning. A sample form is included here.

# 



**Cross Contamination Hazards** 

Serious hazards from poison gasses, fire and explosions are possible when the wrong chemicals or materials come in contact with each other.

Serious injury or death may result if cleaning procedures are not followed.

Safe Operation of Vacuum Trucks in Petroleum Service API RECOMMENDED PRACTICE 2219 Additional copies available from API Publications and Distribution: Information about API Publications, Programs and Services is available on the World Wide Web at: http://www.api.org American 1220 L Street, Northwest



(202) 682-8375

Washington, D.C. 20005-4070 202-682-8000



Available from the WJTA: Recommended Practices for the Use of Industrial Vacuum Equipment.



**RECOMMENDED PRACTICES** FOR THE USE OF INDUSTRIAL VACUUM EQUIPMENT

LAST USE CLEANING/SAFETY FORM

Unit				
Work	performed by		Date	
Note	S			
Area	s NOT decontamina	ated		
1				
2				
3				
4				
5				
Last	material in unit			
M	SDS/SDS attached			Yes - No
Clea	aning agents used			Yes - No
M	SDS/SDS attached			Yes - No
Othe	r			
1	Unit fully winterize	ed?		Yes - No
2	Water tanks draine	ed and flushed?		Yes - No
3	All filters, strainer	s, filter bags cleaned or replaced?		Yes - No
4	Exterior of unit cle	eaned?		Yes - No
5	Debris body, cyclo	one(s), bag house(s), dump tube(s) clea	ned?	Yes - No
6	All other areas ma	terial passes or accumulates cleaned?		Yes - No

### **BIOLOGICAL HAZARDS**

Units used around or for sewer work present some special handling issues due to biological hazards. This also includes all of the unit's exterior that may have come in contact with waste material. The unit's water tanks, debris body, pumps, filters and plumbing can all become contaminated in use. Recycling units will require additional cleaning before servicing.

Thoroughly flushing with fresh water is the first step to cleaning a unit. A wide variety of chemicals and procedures are available for decontamination. Machine components and seals can be damaged by some chemicals. Consult Vactor Service before use. The owner, operator and user are responsible for determining what level of cleaning is required.

# **A** WARNING



Germs and other biological hazards are common in sewers. All operators must wear safety apparel: hard hat, visor and / or goggles, ear protection, rain suit, safety-toe shoes or boots with non skid soles and water proof gloves are recommended to avoid injury and contamination. Additional equipment may be required as determined by an on site safety assessment.

Immediately treat all abrasions, cuts and nicks for contamination. Get medical attention for injuries associated with cleaning sewers, drains and catch basins if biological contamination is suspected. Serious illness may result if this procedure is not followed.

### Symbols





### Symbols



### Symbols



### INDICATORS & SWITCH BEHAVIOR



### **DECALS - COMMON**

SAFETY

**FESG** 

Scan the QR Code

Typical labels and decals found on units. Actual decals used will vary with options.



NOTICE

below, units equipped with cabinet heaters are required to use winter fronts in order to maintain the proper chassis engine operating temperature.

Cabinet Heater System When temperatures are 32° F and

Refer to manual for details.



53676 rA



Service Access Never use access ladders or platforms with the unit running. Shut down and lock out the unit before all service to avoid injury. Refer to the unit manual and safety manual for details.

507592 r0

2100/2100Plus/2100i

NOTICE

This lift eye should only be used

to lift and move manhole grates

Refer to manual for details.

to 700 lbs max, weight, Break

Boom Can Be Damaged

grates loose before lifting.

Other use can damage the

boom

#### **A**CAUTION

HOSE DISCHARGE IS UNDER HIGH PRESSURE



Parts in debris box Unload parts in debris box before using vacuum system. Machine and parts can be damaged if parts are not removed before using.

AVISO

Repuestos dentro de la caia Quite los repuestos dentro de la caja antes de prender el sistema de vacío. La máquina y las piezas pueden ser dañadas si no las . guiten antes de usar.

61724A r

#### **iMPACT**





Explosion and fire hazard Static electricity build up can result in electrical shocks, fire and/or an explosion when vacuuming dry and/or combustible materials. A static electricity charge may build up as material moves through the vacuum system. Grounding and/or bonding the unit may be required. Follow site procedures for static electricity Refer to manual for details



use an air mover to move hydrocarbon or other materials with a flashpoint below 140° (F). Vacuuming, or pump or pressurized off-loading is not permitted unless the flashpoint of the material is 140° (F) or higher.

Refer to manual for details 



Fire hazard Do not use water heater when unit is in motion. For proper combustion air flow and to avoid fuel build up the unit must be stationary and the cabinet door must be open during operation. Refer to manual for details

### 

Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth ts or other reproductive harm.

Always start and operate the engine in a well-ventilated area. sed area, vent the exhaust to the outside Do not modify or tamper with the exhaust system. Do not idle the engine except as necessary

For more information go to www.P65warnings.ca.gov/diesel

### 

Breathing engine exhaust exposes you to chemicals, including carbon monoxide, known to the State of California to cause cancer and birth defects or other reproductive harm Always start and operate the engine in a well-ventilated area. If in an enclosed area, vent the exhaust to the outside. Do not modify or tamper with the exhaust system. Do not idle the engine except as necessary. For more information go to www.P65warnings.ca.gov/diesel

### **DECALS - COMMON**

### SAFETY

Typical labels and decals found on units. Actual decals used will vary with options.



### Check blower oil daily or the start of each shift. All vacuum blowers are equipped

Blower Oil Service

with at least one sight glass at each end of the blower. Depending on blower configuration the sight glasses may be located on either side or the end of the blower at each end, and there may also be upper and lower sight glasses. The oil level must be checked at both ends of the blower while the unit is off and on level ground. Refer to the maintenance section in the manual and the blower manufacturer's manual. 1800167

**WARNING** 

### Confined Space Permit may be required. Consult with your employer. **A**PELIGRO

A DANGER

Espacio restringido Es posible que se requier permiso. Consulte con su ador.



Consult the OPERATOR's manual for complete details. 1800132 rev A

Pump Can Be Damaged Do not operate pump without water.

### A WARNING

Vacuum Hazard Cutting, crushing, suffocation or body rupture from the forces of vacuum could result in serious injur Stay clear of the suction hose inlet end. urn vacuum off before httaching hose, pipe or ies. ep suction hose inlet end ar ground level when

er to SAFETY

Ш



#### NOTICE Master Disconnect Switch

To prevent electrical systems damage, turn switch to OFF position before . servicing chassis or before jump starting.



### AVISO

Interruptor principal de desconexión

Para prevenir daños al sistema eléctrico, coloque el interruptor en posición OFF (Apagado) antes de realizar tareas de mantenimiento en el chasis o antes de un arrangue forzado.



**DECALS - COMMON** 

level ground raise the body above the height of the props. Tilt the in place. Lower debris body until it just rests on the prop(s).

ing 

III props. down and lock out the entire system and chassis before servicin; id any items stored in debris body before using machine. Refer to manual for details

SAFETY



und the door

rear door to just clear the prop(s) and lower door until it just the prop(s). On units that use a safety pin(s) open the door until noles are aligned and insert pin. Use all props or pins. wn and lock out the entire system and chassis before servicing.

### **DECALS - INDUSTRIAL UNITS**

NOTICE

Can cause severe injury or

Before servicing, lock out

NOTICE

Open vacuum relief valve.

Lower engine RPM to idle

relief valve and lower engine

RPM to idle before engaging

NOTICE

Rear Bumper Extension Can

Rear door attachments can damage the rear bumper extension. Fully open

the rear door or remove the rear bumper extension before raising the

debris body to avoid damage.

or disengaging blower may

result in serious engine,

transmission or blower

damage.

Be Damaged

Driveline can be

before engaging or

disengaging blower.

Failure to open vacuum

damaged.

electrical switches and

hydraulic valves before

working on unit.

Crushing Hazard

death.

Typical labels and decals found on units. Actual decals used will vary with options.

www.P65Warnings.ca.gov

NOTICE

Disconnect all chassis and

unit ECU's and batteries

Electrical systems may be

before welding on unit.

damaged by welding.

Read Service manuals

for details

Electrical system

can be damaged.

Do not weld on unit.



Wear protective equipment including footwear and gloves when using or servicing this machine Read SAFETY section ſШ or details

NOTICE

No one shall operate or service this equipment until they read and understand the operation and maintenance manuals Additional copies can be obtained by calling the 24 hour a day service hotline. In the USA or Canada Call: 877-DIAL ESG or 877-342-5374. Outside the USA or Canada call 847-741-4330

Fall Hazard Do not stand or ride on cyclone. 1321111

Et al

### NOTICE Seatbelt use

operators shall not

operate.

**A DANGER** 

required

### CAUTION

Water Pump can be damaged. Charge Pump PTO MUST be ON when using water pump Refer to manual for details.



Close Door Close door before using ladder. Failure to do so can make the ladder unstable. Never use the access ladder while the unit is running

efer to manual for details.



SAFETY

High pressure.

Can cause severe injury or death.

Failure to follow will

lead to explosion.

Do not pressurize

Remove inlet hose

and install camlock

1800144

40857 rl

with inlet hose

connected.

cap before

pressurizing.

NOTICE

Overheating water tank can

damage tank insulation.

Consult the factory for additional information.

above 100° (F).

Water must not be heated

Electrocution hazard Serious injury or death can result from electrocution. Check for overhead wires and obstructions before raising or moving boom. Do not leave boom raised while vehicle is unattended. Do not move vehicle unless boom is in travel mode. Do not allow boom to contact the vehicle or any obstruction.

Be aware of the vehicle's surroundings before operating any of the boom functions to prevent death, injury or equipment damage. Refer to SAFETY section in manual 1800149A rev A

#### Liquid vacuum units only.



**DECALS - INDUSTRIAL UNITS** 

### SAFETY



**DECALS - INDUSTRIAL UNITS** 

SAFETY



Stowed position 512417B



unit when the debris body is raised aised debris body. Use all safety pro

The hydraulic oil tank is pressurized

Turn off air supply valve Disconnect the air line to relieve air pressure from the system.

with air. To avoid severe injury or death relieve hydrualic oil system tank pressure before removing cap.

Refer to manual for details

High pressure

clean and empty for service work. She system and chassis before servicing fer to manual for details



To avoid severe injury or death never close the cabinet door while the cabinet is occupied and the water heater is in use. Exhaust fumes can migrate into the cabinet.



**AWARNING** 

er to SAFETY nual for details.

NOTICE

WARNING

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WARNING

NOTICE





RS) GREASE POINTS DER BRACKET - Mor ETH & BEARING

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NOTICE

**DECALS - INDUSTRIAL UNITS** 

SAFETY





**DECALS - INDUSTRIAL TRAILER UNITS** 

ACAUTION Hot! **AWARNING** NOTICE AVISO ¡Caliente! an be damaged agua puede dañ os. nunca haga fu Aceite hidráulico solamente Hydraulic oil only. Read manual for fluid Lea el manual para más detalles. tails. Ò 741-4330 NOTICE AVISO ATENCIÓ Oil S Inspection Port Ventanilla de inspección A PERIGO lta p insulte el manual para tener detalles. Door Can Be Da NOTICE Et **AWARNING** ΝΟΤΑ NO **A**CAUTION NOTICE NOTICE NOTICE

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AVISO

### **DECALS - SEWER UNITS**

Typical labels and decals found on units. Actual decals used will vary with options.



with inspection cover removed. ADVERTENCIA No poner el motor en marcha con la cubierta de inspección retirada. **INSTRUCCIONES DE** SAFETY INSTRUCTIONS SEGURIDAD If fans cause excess Si los ventiladores causan vibraciones excesivas, vibrations, shut engine off and follow procedure as apagar el motor y seguir los described in the maintenance procedimientos descritos en

# **WARNING**

#### Out of control hose can <u>cause severe injury</u> or death.

The rodder hose creates tremendous pressure and must not be fitted with a reducer or hand held nozzle, or operated outside of the sewer pipe. The back pressure created by such action will cause loss of control and violent movement of the hose and fittings, and the release of high pressure water .

Do not use improper fittings or use out of sewer pipe. Refer to manual for details.

Refer to manual for details.

# CAUTION

#### Driveline can be damaged.

Open vacuum relief valve. Lower engine RPM to idle before engaging or disengaging blower.

Failure to open vacuum relief valve and lower engine RPM to idle before engaging or disengaging blower may result in serious engine, transmission or blower damage.

1800121A rA

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la sección de mantenimiento de la guía del operador.

section of the operator's

auide.

1800150

### **DECALS - SEWER UNITS**

Typical labels and decals found on units. Actual decals used will vary with options.

Jetter units



#### **Combination units**







$\begin{tabular}{ c c c c c } \hline Part & Part$		1st letter Hose dia. (in) A = 1-1/4	<b>2nd letter</b> Flow (GPM) A = 35 B = 40	
Pressure (psi) G = 65 A = 1850 H = 70 B = 2000 I = 75 C = 2500 J = 80 D = 3000 L = 100 Made in USA M = 120 Part G = 65 Sewer maintenance tools operate at high pressure. Sociato tool two feet into sewer line before operating. Build pressure slowly to ensure tool is positioned correctly. Turn off pressure source before removing tool for sewer line of the source before removing tool	200	C = 3/4	C = 45 D = 50	Operating tool outside of sewer line may result in
Part Made in USA M = 120 correctly. Turn off pressure source before removing tool from severe line	<b>VAC</b> <sup>1</sup>	Pressure (psi) A = 1850 B = 2000 C = 2500	G = 65 H = 70 I = 75 J = 80 K = 90	Sewer maintenance tools operate at high pressure. Position tool two feet into sewer line before operating. Build pressure slowly to
Part from sewer line		Made in USA	M = 120	correctly. Turn off pressure
48902	Part No.			from sewer line.





#### New models with 2100i type controls



### SAFETY

### **DECALS - SEWER UNITS**



**DECALS - SEWER UNITS** 

CILOR

# 456 MPACT Consult the OPERATOR'S manual for consult the OPERATOR'S manual for complete details on SAFETY and proper OPERATOR'S manual, store oreguited. Consult the OPERATOR'S manual for complete details. Never operate without manual, automatic and safety vacuum reliefs installed and properly operating. Set vice transverse manual) Inspect all vacuum hoses Orain, inspect and clean vacuum strainer & filter Orain, inspect and clean all air/water filters and V-strainers Inspect for proper functioning of vacuum relief interval Inspect for proper functioning of vacuum reliv valves Inspect inter thead and inlet boot seals Inspect the rodder hose for excessive wear, damage or improper assembly of fittings Inspect hoses and gaskets Inspect date clean all door seals before closing doors Drain air tanks and silencers Inspect cyclones for excess material (if equipped) Scan the QR Code with your mobile divice or visit. equipped) • Consult the OPERATOR'S manual for

### Drain Checklist Empty all water tanks Remove all Y-strainers at water pump & other options Remove ve hand gun outlet(s) & recirc ve accumulator valve drain plug ain water guns emove optional debris body washout

- move optional debits body washout stem plug smove plug from under the front hose reel emove plug to water pump manifold sen all cyclones and allow to drain en microstrainer housing drains sen silencer drain
- Leave all drains open until next use

5

## · Inspect all safety equipment, guards, etc Activate E-Stop - check for messages Check blower oil level Check hydraulic oil level Service chassis (consult manufacturer's

Daily Service Check List

#### Freezing Weather Drain Procedure

- Purge System Open handgun and rodder ball valves. REMOVE rodder nozela and SECURE hose end to an adjacent hose loop so reel can rotate. Point the hose end towards the ground as ice and water may be ejected while running rodder
- water may be ejected while running rodder pump. Start engine and engage water pump for two minutes at stow speed to expel any water. Turn OFF water pump. Remove drain plugs form water pump for one minute at stow speed to expel any water. Turn OFF water pump. Rotate hose real in the PAVIN direction to expel any water in hose.



- WEEKLT (29TR3) GREASE POIN Hose real pivot, hose guide, extensions All driveline joints Hoist cylinder pins upper & lower mc Debris body mounting hinge Rear door all locks and pivot points Rear door hinges Level indicator

- Trash pump option (location will vary) Boom hinges & sleeves monthly Coat boom slew bearing All small door hinges
- HOSE REEL PIVOT BEARING & LOCKS While greasing the hose reel pivot bearing grease zerks rotate the hose reel back and forth The hose reel locks are lubricated through the right hand zerk. Use two pumps per zerk.

### 

High pressure water. Fight pressure water. Serious injury or death can result from sudden release of high pressure water. Remove the rodder hose norzle and secure the hose end to an adjacent hose loop so real can rotate. Point the hose end towards the ground as ice may be ejected wille running rodder pump.

Both pressure side water valves must be op prior to operating rodder pump. Refer to manual for details.

#### NOTICE

Boom Can Be Damaged The boom should only be used for its published intended and rated use. Do not overload. To av damage do not use as a lifting device.



**DECALS - SEWER TRAILER UNITS** 



Do not operate without all guards and safety systems in place.

### A WARNING

#### High pressure water.

Serious injury or death can result from sudden release of high pressure water. Remove the rodder hose nozzle and secure the hose end to an adjacent hose loop so reel can rotate. Point the hose end towards the ground as ice may be ejected while running the water pump.

Set the water selector valve to tank prior to operating water pump. The rodder hose must be properly in place before running the water pump.

re running the water pump.

Refer to manual for details.

ation and Service Procedures							
1.	Empty all water tanks						
2.	Remove all Y-strainers at fill, water pump & of	her opt	ions				
3.	Drain water guns						
	Leave all drains open until n	ext us	se				
	Service Checklist	Daily	Weekly	Monthly			
1.	Check engine, pump and hydraulic oil levels	Х					
2.	Drain/inspect all water filters and Y-strainers	Х					
3.	Check rodder hose for wear and damage	Х					
4.	Check tire inflation, lights and brakes	Х					
5.	Check hitch connection and safety chains X						
6.	Check all safety euipment, guards, etc. X						
7.	Check engine belts and hoses X						
8.	Check wheel lug nuts X						
9.	Grease wheel bearing X						
10.	Check pump belt for wear (if equipped) X						
11.	Grease hose reel bearing			Х			
E-Stop Operation E-Stop idles down and stops the engine/water pump To restart • Reset E-stop switch and on remote if equipped.							

 Turn ignition key back to Off to reset system.





#### High pressure water.

Serious injury or death can result from sudden release of high pressure water. The hose end and water discharge direction may become uncontrolled.

Set the water selector valve to tank prior to operating water pump.

The rodder hose must be properly in place before running the water pump.

Refer to manual for details.

509171B r0

# 

Rotating Drive Hazard Contact with drive may cause severe personal injury or death.

Never operate with covers removed. Stay clear when operating.

5004740

SAFETY



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